Water Resources Data Minnesota Water Year 1987

Volume 2. Upper Mississippi and Missouri River Basins

Volume 1
Great Lakes and
Souris-Red-Rainy River Basins
Volume 2
Upper Mississippi and
Missouri River Basins

④

U.S. GEOLOGICAL SURVEY WATER-DATA REPORT MN-87-2

Prepared in cooperation with the Minnesota Department of Natural Resources, Division of Waters; the Minnesota Department of Transportation; and with other State, municipal, and Federal agencies

CALENDAR FOR WATER YEAR 1987

1986

OCTOBER

S	M	T	W	T	F	S
			1	2	3	4
5	6	7	8	9	10	11
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NOVEMBER

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1987

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MARCH

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31						

JUNE

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JULY

S	M	T	W	T	F	S
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AUGUST

S	M	T	W	T	F	S
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9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	31					

SEPTEMBER

S	M	T	W	T	F	S
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30			

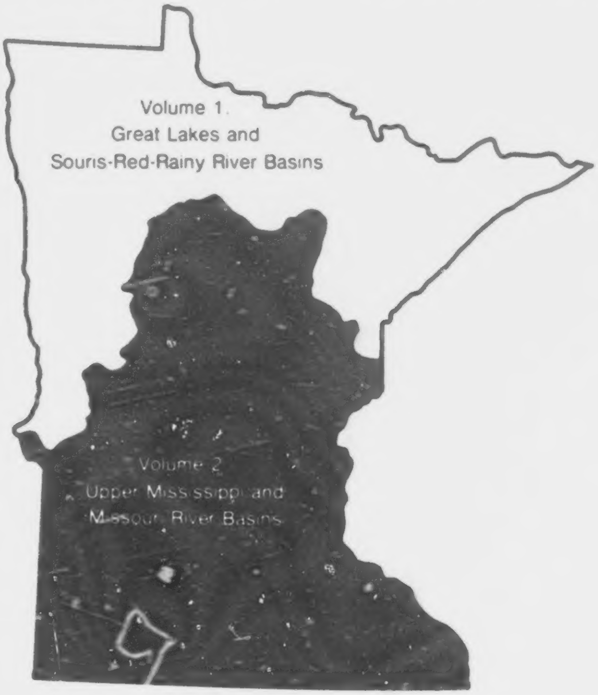
U.S. DEPARTMENT OF THE INTERIOR
March 3 1849

Water Resources Data Minnesota

Water Year 1987

Volume 2. Upper Mississippi and Missouri River Basins

by Kurt T. Gunard, Joseph H. Hess, James L. Zirbel, and Charles E. Cornelius


Volume 1.
Great Lakes and
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U.S. GEOLOGICAL SURVEY WATER-DATA REPORT MN-87-2

Prepared in cooperation with the Minnesota Department of Natural Resources, Division of Waters; the Minnesota Department of Transportation; and with other State, municipal, and Federal agencies

III

DEPARTMENT OF THE INTERIOR

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GEOLOGICAL SURVEY

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U.S. Geological Survey
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St. Paul, Minnesota 55101

1989

PREFACE

This volume of the annual hydrologic data report of Minnesota is one of a series of annual reports that document hydrologic data gathered from the U.S. Geological Survey's surface- and ground-water data-collection networks in each State, Puerto Rico, and the Trust Territories. These records of streamflow, ground-water levels, and water quality provide the hydrologic information needed by State, local, and Federal agencies, and the private sector for developing and managing our Nation's land and water resources. Hydrologic data for Minnesota are contained in two volumes:

Volume 1. Great Lakes and Souris-Red-Rainy River Basins
Volume 2. Upper Mississippi and Missouri River Basins

This report is the culmination of a concerted effort by dedicated personnel of the U.S. Geological Survey who collected, compiled, analyzed, verified, and organized the data, and who typed, edited, and assembled the report. In addition to the authors, who had primary responsibility for assuring that the information contained herein is accurate, complete, and adheres to Geological Survey policy and established guidelines, the following individuals contributed significantly to the preparation of this report:

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Henry W. Anderson, Jr., Ground-Water Project Chief, Minnesota District

Most of the data were collected, processed, and tabulated by the following individuals:

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Water-resources data for the 1987 water year for Minnesota consist of records of stage, discharge and water quality of streams; stage, contents, and water quality of lakes and reservoirs, and water levels and water quality in wells and springs. This volume contains discharge records for 55 gaging stations; stage and contents for 8 lakes and reservoirs; water quality for 14 stream stations, 1 lake station, 1 precipitation station, and 96 wells; and water levels for 136 observation wells. Also included are 75 high-flow partial-record stations and 93 low-flow partial-record stations. Additional water data were collected at various sites, not part of the systematic data collection program and are published as miscellaneous measurements or low-flow investigations. These data, together with the data in Volume 1, represent that part of the National Water Data System operated by the U. S. Geological Survey and cooperating State and Federal Agencies in Minnesota.

17. Document Analysis a. Descriptors

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GAGING STATIONS, IN DOWNSTREAM ORDER, FOR WHICH RECORDS ARE PUBLISHED

Note.--Date for partial-record stations and miscellaneous sites for both surface-water quantity and quality are published in separate sections of the data report. See references at the end of this list for page numbers for these sections

[Letters after station name designates type of data: (d) discharge; (e) gage height, elevation, or contents; (c) chemical, radio-chemical, or pesticides; (b) biological or micro-biological; (p) physical (water temperature, sediment, or specific conductance)]

UPPER MISSISSIPPI RIVER BASIN		
Mississippi River:		
Winnibigoshish Lake near Deer River	(- e - - -)	38
Mississippi River at Winnibigoshish Dam, near Deer River	(d - - - -)	39
LEECH LAKE RIVER BASIN		
Williams Lake near Akeley	(- - c b p)	40
Leech Lake at Federal Dam	(- e - - -)	46
Leech Lake River at Federal Dam	(d - - - -)	47
Pokegama Lake near Grand Rapids	(- e - - -)	48
Mississippi River at Grand Rapids	(d - - - p)	49,190
SWAN RIVER BASIN		
Swan River near Calumet	(d - - - p)	50,190
SANDY RIVER BASIN		
Sandy Lake at Libby	(- e - - -)	51
Sandy River at Sandy Lake Dam, at Libby	(d - - - -)	52
Mississippi River below Sandy River, near Libby	(d - - - -)	53
Mississippi River at Aitkin	(d - - - p)	54,190
PINE RIVER BASIN		
Pine River Reservoir at Cross Lake	(- e - - -)	55
Pine River at Cross Lake Dam, at Cross Lake	(d - - - -)	56
CROW WING RIVER BASIN		
Straight River at County Highway 125 near Osage	(d - - - p)	57,190
Straight River at County Highway 115 near Park Rapids	(d - - - p)	58,191
Straight River near Park Rapids	(d - - - p)	59,191
Long Prairie River at Long Prairie	(d - - - p)	60,191
Gull River:		
Gull Lake near Brainerd	(- e - - -)	61
Gull River at Gull Lake Dam, near Brainerd	(d - - - -)	62
Mississippi River near Royalton	(d - c b p)	63,191
ELK RIVER BASIN		
Elk River near Big Lake	(d - - - p)	66,191
CROW RIVER BASIN		
North Fork Crow River:		
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Rum River near St. Francis	(d - - - p)	70,192
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Well 451210093170201 Local number 031N24W01CBB01........ 200
Well 451742093122102 Local number 032N23W04AAD02........ 201
Well 452305093141501 Local number 033N23W05BAB01........ 201
Well 451938093223101 Local number 033N24W30ABB01........ 202

BELTRAMI

Well 473023094570901 Local number 147N34W35ADC01........ 203

BIG STONE

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Well 453330096420201 Local number 124N48W17AAA01........ 204

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Well 433846093220601 Local number 102N21W09CCB01........ 222
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Well 444801093202801 Local number 027N24W30BDA01........ 226
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Well 433953091251801 local number 102N05W03DCC01 235
Well 433935091252001 Local number 102N05W03DCC02 235
Well 443935091252901 Local number 102N05W03DCC03 236

HUBBARD

Well 465142094433201 Local number 139N32W16AAA01 236

ISANTI

Well 453125093181101 Local number 035N24W14BCD01 237
Well 453058093175901 Local number 035N24W14CDC01 237
Well 453410093140001 Local number 036N23W32ACB01 238

ITASCA

Well 471450093322001 Local number 055N25W17ACD01 239

JACKSON

Well 434742095191501 Local number 104N37W19DBD01 239

KANABEC

Well 455236093172301 Local number 039N24W11DDC01 240

KANDIYOHI

Well 450730095014801 Local number 119N35W14ABB01 241

LE SUEUR

Well 442522093543901 Local number 111N26W14ADA01 242
Well 443234093333501 Local number 112N23W02BAB01 242
Well 443147093374501 Local number 112N23W06DDD01 243

LINCOLN

Well 441705096084501 Local number 110N44W33DCD01 243

MARTIN

Well 434359094422201 Local number 103N32W08CCD01 244
Well 434725094483001 Local number 104N33W28BAB01 244

MC LEOD

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Well 444704094090801 Local number 115N28W11ADD01 246
Well 444819094164701 Local number 116N29W35DDC01 246
Well 445721094031201 Local number 117N27W10DAA01 247

MEEKER

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Well 451542094322301 Local number 121N31W26BDC01 248

MILLE LACS

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MORRISON

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MOWER

Well 434010093010801 Local number 102N18W05ACB01 250
Well 434417093521001 Local number 103N17W09DAA01 250

OLMSTED

Well 435920092273801 Local number 106N14W14ADB01 251

RAMSEY

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Well 445955093011002 Local number 029N22W14CAB02 252
Well 445955093011003 Local number 029N22W14CAB03 253
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Well 445918092590901 Local number 029N22W24ADA01 253
Well 445700093051001 Local number 029N22W31DDD01 254
Well 450026093084201 Local number 029N23W11CCC01 255
Well 445751093072301 Local number 029N23W25CCD01 255
Well 445739093081201 Local number 029N23W35BAD01 256
Well 450414093012701 Local number 030N22W23CBB01 257
Well 450723093071801 Local number 030N23W01BAB01 257
Well 450238093082501 Local number 030N23W35BDC01 258

REDWOOD

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Well 443051095074201 Local number 112N36W14AAA01 260
Well 442906095064101 Local number 112N36W24DDC01 261

RENVILLE

Well 444437094425001 Local number 115N32W29AAC01 261

RICE

Well 441912093162901 Local number 110N20W19BDC01 262
Well 442543093113701 Local number 111N20W11CDC01 262
Well 442751093240701 Local number 112N21W31CBB01 263

SCOTT

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Well 444025093220801 Local number 114N21W20BAA01 256
Well 443752093254401 Local number 114N22W35DCC01 267
Well 444633093212901 Local number 115N21W09CCC01 267
Well 444427093353901 Local number 115N23W28BDD01 268
Well 444427093353902 Local number 115N23W28BDD02 268
Well 444427093353903 Local number 115N23W28BDD03 269

GROUND-WATER WELLS, BY COUNTY, FOR WHICH RECORDS ARE PUBLISHED--Continued

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SHERBURNE
Well 452938093432701 Local number 035N27W29DBB02 269
STEELE
Well 435742093164001 Local number 106N20W30BAD01 270
SWIFT
Well 451913095370201 Local number 121N39W06BDB01 270
WABASHA
Well 442708092155401 Local number 111N12W04BBD01 271
WADENA
Well 462415095003001 Local number 134N34W19ADD01 271
WASHINGTON
Well 445125092464001 Local number 027N20W02BCC01 272
Well 445125092464002 Local number 027N20W02BCC02 272
Well 445125092464003 Local number 027N20W02BCC03 273
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Well 445536092462401 Local number 028N20W11CAA01 273
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Well 450134092583101 Local number 029N21W06CAD01 275
Well 450027092552101 Local number 029N21W10CCC01 275
Well 450858092575001 Local number 031N21W28ABD01 276
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WINONA
Well 435746092034202 Local number 106N10W19DDA02 279
WRIGHT
Well 450318094040603 Local number 118N27W03CAC03 280
Well 450403093544501 Local number 119N26W35DDA01 280
YELLOW MEDICINE
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WATER RESOURCES DATA FOR MINNESOTA, 1986

INTRODUCTION

The Water Resources Division of the U.S Geological Survey, in cooperation with State agencies, obtains a large amount of data pertaining to the water resources of Minnesota each water year. These data, accumulated during many years, constitute a valuable data base for developing an improved understanding of the water resources of the State. To make these data readily available to interested parties outside the Geological Survey, the data are published annually in this report series entitled "Water Resources Data - Minnesota."

Water resources data for the 1987 water year for Minnesota consist of records of stage, discharge, and water quality of streams; stage, contents, and water quality of lakes and reservoirs; and water levels and water quality of ground water. This volume contains discharge records for 55 gaging stations; stage and contents for 8 lakes and reservoirs; water quality for 14 stream stations, 1 lake station, 1 precipitation station, and 96 wells; and water levels for 136 observation wells. Also included are 75 high-flow partial-record stations and 93 low-flow partial-record stations. Additional water data were collected at various sites, not involved in the systematic data collection program, and are published as miscellaneous measurements or low-flow investigations. These data, together with the data in Volume 1, represent that part of the National Water Data System collected by the U.S. Geological Survey and cooperating State and Federal agencies in Minnesota.

This series of annual reports for Minnesota began with the 1961 water year with a report that contained only data relating to the quantities of surface water. For the 1964 water year, a similar report was introduced that contained only data relating to water quality. Beginning with the 1975 water year, the report was changed to present, in one volume, data on quantities of surface water, quality of surface and ground water, and ground-water levels.

Prior to introduction of this series and for several water years concurrent with it, water-resources data for Minnesota were published in U.S. Geological Survey Water-Supply Papers. Data on stream discharge and stage and on lake or reservoir contents and stage, through September 1960, were published annually under the title "Surface-Water Supply of the United States, Parts 4, 5 and 6A." For the 1961 through 1970 water years, the data were published in two 5-year reports. Data on chemical quality, temperature, and suspended sediment for the 1941 through 1970 water years were published annually under the title "Quality of Surface Waters of the United States," and water levels for the 1935 through 1974 water years were published under the title "Ground-Water Levels in the United States." The above mentioned Water-Supply papers can be consulted in the libraries of the principal cities of the United States and may be purchased from Distribution Branch, Text Products Section, U.S. Geological Survey, 604 Pickett Street, Alexandria, VA 22304.

Publications similar to this report are published annually by the Geological Survey for all States. These official Survey reports have an identification number consisting of the two-letter State abbreviation, the last two digits of the water year, and volume number. For example, this volume is identified as the "U.S. Geological Survey Water-Data Report MN-87-2. For archiving and general distribution, the reports for 1971-1974 water years also are identified as water-data reports. These water-data reports are for sale in paper copy or in microfiche by the National Technical Information Service, U.S. Department of Commerce, Springfield, VA 22161.

Additional information, including current prices, for ordering specific reports may be obtained from the district chief at the address given on the back of the title page or by telephone 612) 229 2600.

COOPERATION

The U.S. Geological Survey and organizations of the State of Minnesota have had cooperative agreements for the systematic collection of streamflow records since 1909, for ground-water levels since 1948, and for water-quality records since 1952. Organizations that assisted in collecting the data in this report through cooperative agreement with the Survey are:

Minnesota Department of Natural Resources, Division of Waters, Ronald N. Nargang, director.

Minnesota Department of Transportation, Leonard W. Levine, commissioner.

Metropolitan Waste Control Commission of the Twin Cities Area, Peter E. Meintsman, chairperson

Elm Creek Conservation Commission, Gerald E. Butcher, chairperson.

Lower Red River Watershed Management Board, Donald Ogaard, President

Red Lake Reservation Business Committee, Roger Jourdain, chairperson.

Rochester Public Utilities, R. John Miner, General Manager

White Earth Reservation Business Committee, Darrell Wadena, chairperson.

Assistance in the form of funds or services was given by the Corps of Engineers, U.S. Army, in collecting records for 49 gaging stations and 12 water-quality stations published in this report. Thirteen gaging stations in the Hudson Bay and St. Lawrence River basins were maintained by funds appropriated to the United States Department of State. Eight of these, on water adjacent to the international boundary, are maintained by the United States (or Canada) under agreement with Canada (or the United States), and the records are obtained and compiled in a manner equally acceptable in both countries. These stations are designated herein as "International gaging stations."

SUMMARY OF HYDROLOGIC CONDITIONS

PRECIPITATION

Precipitation during the 1987 water year varied from 4 in. (inches) above normal in small areas of northern Minnesota to 12 in. below normal in small areas of central and east-central Minnesota (fig. 1). Normal annual precipitation in Minnesota ranges from 19 in. in the northwest to 32 in. in the southeast. Precipitation during water year 1987 ranged from less than 16 in. in parts of the west, central, and east-central Minnesota to 32 in. in parts of the northeast and southeast.

Precipitation was generally below normal statewide during the first quarter of the water years. However, it was above normal in the south-central and southeastern regions during October, and above normal in the north and west during November. During the second quarter, precipitation was below normal statewide in January and February, but returned to the above-normal range in the west-central, central, and southwestern regions during March. During the third quarter, precipitation was considerably below normal statewide, but rose to the above-normal range in the northern 1/3 of the State during May. During the final quarter of the water year, the deluge came. Above normal precipitation occurred over the entire State in July. Two separate storms with recurrence intervals greater than 100 years occurred within 1 week in the east-central region of the State. More than 1/2 the average annual precipitation of 26 in. fell in 1 month--14.5 in. However, this precipitation pattern was short-lived, and, in August and September, precipitation was again deficient statewide except for the south-central region where it was above normal during August.

As a result of the precipitation patterns most of Minnesota experienced below-normal annual precipitation except for a few scattered areas in the north and east-central regions. According to the State Climatology Office "The winter of 1986-87 was one of the warmest and driest in Minnesota's recorded history." At the close of the 1987 water year, much of Minnesota was 4 to 8 in. below the long-term average annual precipitation.

A long-term wet cycle of about 10 years appears to have ended with the 1986 water year when the last of several excess precipitation records were set. In direct contrast, the deficient precipitation in 1987 could be signaling the beginning of a drought period.

STREAMFLOW

Average annual runoff in Minnesota ranges from 1 in. in the west to 14 in. in the northeast. Annual runoff in 1987 ranged from 1 in. along the western border to 16.5 in. in northeastern Minnesota (table 1). Runoff varied from as low as 25 percent of average in a small part of the northwest to more than 190 percent of average in a small part of the west. Runoff recorded at a considerable number of streams scattered throughout the State was about 50 percent of the long-term average. If streamflow had not been excessive over much of the State in the beginning of the water year, along with saturated soils and high ground-water levels, the runoff recorded at many more streams would have fallen to near 50 percent of the long-term average.

As a result of a lengthy, extremely wet, antecedent period in 1986, records for stations in central and southern Minnesota had annual runoffs of near average to considerably above average for 1987. Runoff in the Mississippi River at Aitkin, in east-central Minnesota, was 5.80 in. or 89 percent of the 42-year average annual runoff of 6.55 in. In contrast, runoff was 10.26 in. in 1986, or 156 percent of the long-term average. Runoff in the Crow River at Rockford, in the southern part of central Minnesota, was 4.57 in. or 115 percent of the 62-year average annual runoff of 3.99 in. In comparison, runoff during the previous year was 14.84 in. or 373 percent of the long-term average (a record high). In west-central Minnesota, runoff in the Chippewa River near Milan was 4.43 in., 1.9 times the 50-year average annual runoff of 2.33 in. This is substantially above average, but low compared to the 9.49 in. of runoff in the previous year (also a record high). Runoff to the Des Moines River at Jackson, in southwestern Minnesota, was 5.57 in., 1.5 times the 52-year average annual runoff of 3.70 in. However, this is considerably less than runoff in the previous year which was 10.35 in. and 2.8 times the average annual runoff. Annual and monthly mean discharges for these stations are compared to median discharges for a 30-year base period (fig. 2).

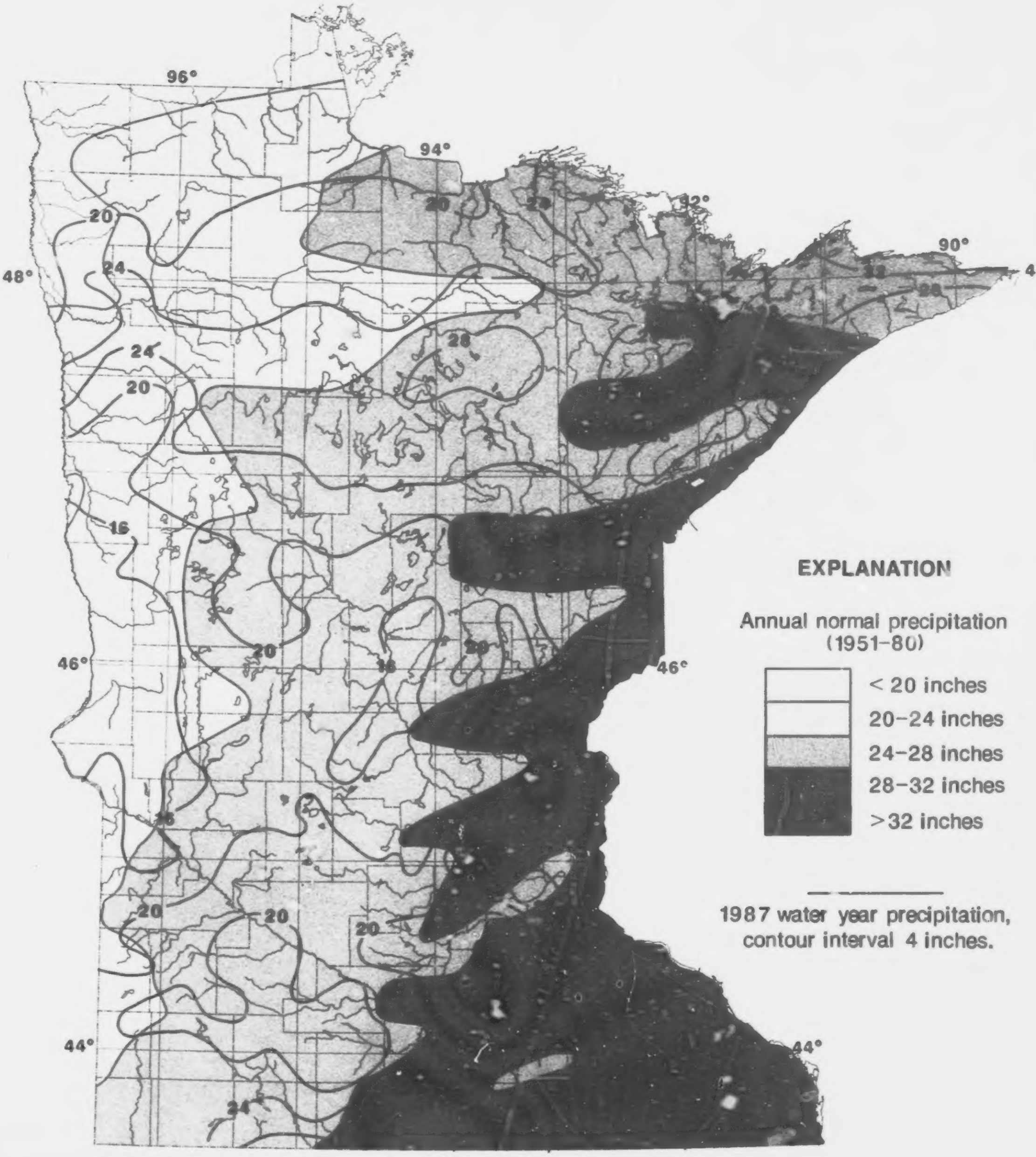
Although record-breaking monthly runoff volumes were recorded at several gaging stations, no peaks of record were exceeded during water year 1987 at any stations for which records are published in this volume. However, the storms in July of 1987 in and near the Twin Cities produced very high rates and volumes of runoff, but did not involve any presently gaged streams. In the section of this report labeled "discharge measurements at miscellaneous sites" are listed record-breaking peak discharges on several small, presently ungaged, streams which carried runoff produced by two thunderstorms that occurred within one week in July. Maximum rainfall in each of these storms had recurrence intervals greater than 100 years. Consequently, runoff in all of the streams was near, or exceeded, the 100-year value; runoff in one stream was greater than twice the 100-year recurrence value. All of these streams are located in a small area including Minneapolis and the western and southern suburbs thereof in east-central Minnesota.

The combined storage in the six Mississippi River Headwater Reservoirs (Winnibigoshish, Leech, Pokegama, Pine, Sandy, and Gull), located in northern and central Minnesota, was 1,593,396 acre-feet at the end of the 1987 water year--an increase of 2,381 acre-feet over the previous year.

WATER QUALITY

Three U.S. Geological Survey National Stream-Quality Accounting Network (NASQAN) stations and one bench-mark station are used to depict variability in concentrations of dissolved solids and nitrate as nitrogen in the Upper Mississippi River basin (figs. 3 and 4); there are no water-quality stations in the Missouri River basin in Minnesota.

Dissolved-solids concentrations generally were slightly lower than the monthly medians in the Mississippi River near Royalton, generally higher than the monthly medians in the Minnesota River near Jordan, and always higher than the medians in the North Fork Whitewater River near Elba. Dissolved-solids concentrations in the Mississippi River at Nininger were higher than monthly medians in early winter and in spring and lower than monthly medians in late winter and in summer.


96°
94°
92°
90°
48°
48°
46°
46°
44°
44°
20
20
20
24
24
28
28
32
16
16
20
18
20
16
20
20
20
24
EXPLANATION
Annual normal precipitation (1951-80)
< 20 inches
20-24 inches
24-28 inches
28-32 inches
>32 inches
1987 water year precipitation, contour interval 4 inches.

Base from U.S. Geological Survey
State base map, 1965

Data from State Climatology Office,
Minnesota Department of Natural
Resources Division of Waters

SCALE
0 25 50 MILES
0 25 50 KILOMETERS

Figure 1.--Precipitation, in inches, during 1987 water year compared to normal annual precipitation for Minnesota

Table 1.--Runoff at streamflow stations in 1987 compared with long-term average for river basins in Minnesota

[Average runoff for station is based on period of record. Maximum runoff and year of occurrence are shown. mi^2, square miles.]

Station No.	Station name	Drainage Area (mi^2)	Runoff (inches)		Maximum	
			1987 Water year	Average	Inches	Water year
05201500	Mississippi River at Winnibigoshish Dam near Deer River	1,442	5.11	4.93	11.61	1898*
05206500	Leech Lake River at Federal Dam	1,163	5.43	4.34	9.52	1899*
05211000	Mississippi River at Grand Rapids	3,370	7.71	4.81	9.78	1906
05216860	Swan River near Calumet	114	6.99	7.89	12.75	1966
05219000	Sandy River at Sandy Lake Dam at Libby	421	6.07	7.23	17.43	1986
05227500	Mississippi River at Aitkin	6,140	5.80	6.55	11.03	1966
05231000	Pine River at Cross Lake Dam at Cross Lake	562	5.53	5.34	13.48	1905*
05245100	Long Prairie River at Long Prairie	432	7.61	5.38	11.51	1972
05247000	Gull River at Gull Lake Dam near Brainerd	287	5.00	5.20	10.79	1972
05267000	Mississippi River near Royalton	11,600	5.48	5.43	9.05	1985
05275000	Elk River near Big Lake	615	5.12	6.07	14.77	1986
05278000	Middle Fork Crow River near Spicer	179	7.89	5.05	12.29	1984
05280000	Crow River at Rockford	2,520	4.57	3.99	11.04	1984
05286000	Rum River near St. Francis	1,360	6.65	6.38	15.10	1986
05287890	Elm Creek near Champlin	84.9	2.42	5.76	12.01	1986
05288500	Mississippi River near Anoka	19,100	5.99	5.71	9.74	1985
05291000	Whetstone River near Big Stone City	389	1.09	1.76	6.32	1986
05292000	Minnesota River at Ortonville	1,160	0.68	1.30	4.26	1986
05293000	Yellow Bank River near Odessa	398	1.07	2.06	7.68	1986
05294000	Pomme de Terre River at Appleton	905	2.28	1.73	5.45	1986
05300000	Lac qui Parle River near Lac qui Parle	983	1.24	1.85	6.42	1986
05301000	Minnesota River near Lac qui Parle	4,050	3.00	2.35	8.41	1986
05304500	Chippewa River near Milan	1,870	4.43	2.33	9.49	1986
05311000	Minnesota River at Montevideo	6,180	2.48	1.66	6.51	1986
05313500	Yellow Medicine River near Granite Falls	653	3.45	2.60	9.98	1984
05315000	Redwood River near Redwood Falls	697	3.02	2.47	9.22	1983
05317000	Cottonwood River near New Ulm	1,280	4.25	3.44	12.63	1969
05317200	Little Cottonwood River near Courtland	230	2.67	3.58	9.45	1983

---

* Calendar year

Table 1.--Runoff at streamflow stations in 1987 compared with long-term average for river basins in Minnesota.--Continued

[Average runoff for station is based on period of record. Maximum runoff and year of occurrence are shown. mi^2, square miles.]

Station No.	Station name	Drainage Area (mi^2)	Runoff (inches) 1987 Water year	Runoff (inches) Average	Maximum Inches	Maximum Water year
05319500	Watonwan River near Garden City	812	3.35	5.80	13.83	1983
05320000	Blue Earth River near Rapidan	2,430	3.47	5.21	16.08	1983
05320500	Le Sueur River near Rapidan	1,100	3.08	5.81	16.53	1983
05325000	Minnesota River at Mankato	14,900	3.25	2.76	8.44	1986
05327000	High Island Creek near Henderson	237	2.58	5.43	13.54	1986
05330000	Minnesota River near Jordan	16,200	3.57	3.20	8.94	1986
05331000	Mississippi River at St. Paul	36,800	5.02	4.15	11.05	1986
05336700	Kettle River below Sandstone	863	6.16	11.74	21.87	1972
05337400	Knife River near Mora	102	3.49	8.95	17.97	1986
05340500	St. Croix River at St. Croix Falls	6,240	7.62	9.44	18.65	1986
05344500	Mississippi River at Prescott	44,800	5.53	5.27	11.68	1986
05345000	Vermillion River near Empire	110	7.01	7.01	13.72	1986
05353800	Straight River near Fairbault	442	5.49	8.23	18.59	1983
05374900	Zumbro River at Kellogg	1,400	8.95	8.78	14.93	1983
05376000	North Fork Whitewater River near Elba	101	7.46	6.49	12.54	1974
05378500	Mississippi River at Winona	59,200	6.84	6.43	13.04	1986
05457000	Cedar River near Austin	425	5.92	6.71	18.15	1983
05476000	Des Moines River at Jackson	1,220	5.57	3.70	13.35	1983

Nitrate concentrations reported as nitrogen (analyzed for nitrate plus nitrite, but nitrite concentration assumed to be negligible) were slightly higher than average in the Mississippi River near Royalton and higher than average in the North Fork Whitewater River near Elba. Nitrate concentrations were above average in early winter and midsummer, and below average in late winter and in the spring in the Minnesota River near Jordan and in the Mississippi River at Nininger.

Water samples were collected from 96 wells. Nitrate concentrations were above the primary drinking-water standard of 10 mg/L (Minnesota Pollution Control Agency, 1988) in 14 samples. Eight samples were above the iron standard of 300 µg/L, and 14 samples were above the manganese standard of 50 µg/L. Trace-element concentrations were generally within the primary drinking-water standards.

GROUND-WATER LEVELS

Twenty wells in the unconfined (water-table) aquifer are used to describe surficial ground-water conditions in the area of the State covered by Volume 2 (fig. 5). Water levels were normal or above normal for the year in 70 percent or 14 of these wells. Record monthly highs were recorded during the fall (October-December) in nine of the wells. Water levels in wells in east-central, central, and west-central Minnesota were above normal from October through March, and were generally normal from April through September. Water levels in wells in southeastern Minnesota were above normal for the fall and winter months, normal during spring, and below normal during the summer. Water levels in south-central and the southern parts of central and east-central Minnesota were normal during the fall and winter months but were below normal during the spring and summer. Record monthly low levels were recorded at four wells in this area during that time. Record monthly low levels were recorded at four wells in this area during that time. Record monthly highs as well as record monthly lows were recorded in two wells in central and southeast Minnesota during the year.

Water levels in confined aquifers are represented by 116 wells completed in buried drift or bedrock in the area of the State covered by Volume 2 (figs. 6a, 6b). Water levels in 17 of 20 wells in buried drift were normal or above normal for the year. Levels in two wells were above normal for the first half of the year and normal or below normal for the remainder. Water levels in only one well were below normal for the entire year. Record monthly high levels were recorded in 13 wells in central and southeast Minnesota during the first quarter of the water year. Water levels also were at record highs during the second quarter (January-March) in eight of these wells. At one well in southeast Minnesota record monthly high levels were recorded during the entire year. Record monthly low levels were recorded at two wells in east-central Minnesota during June or July.

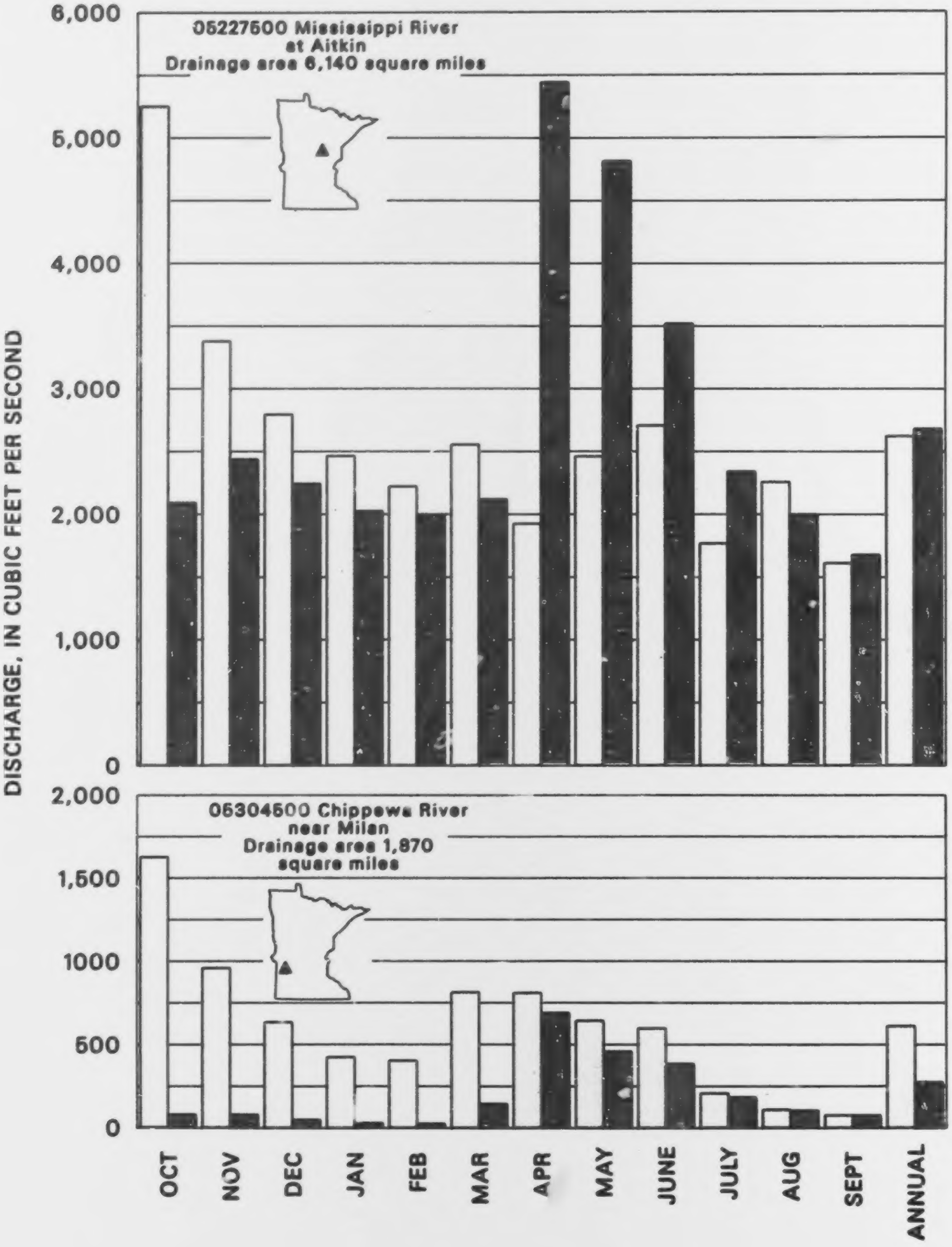
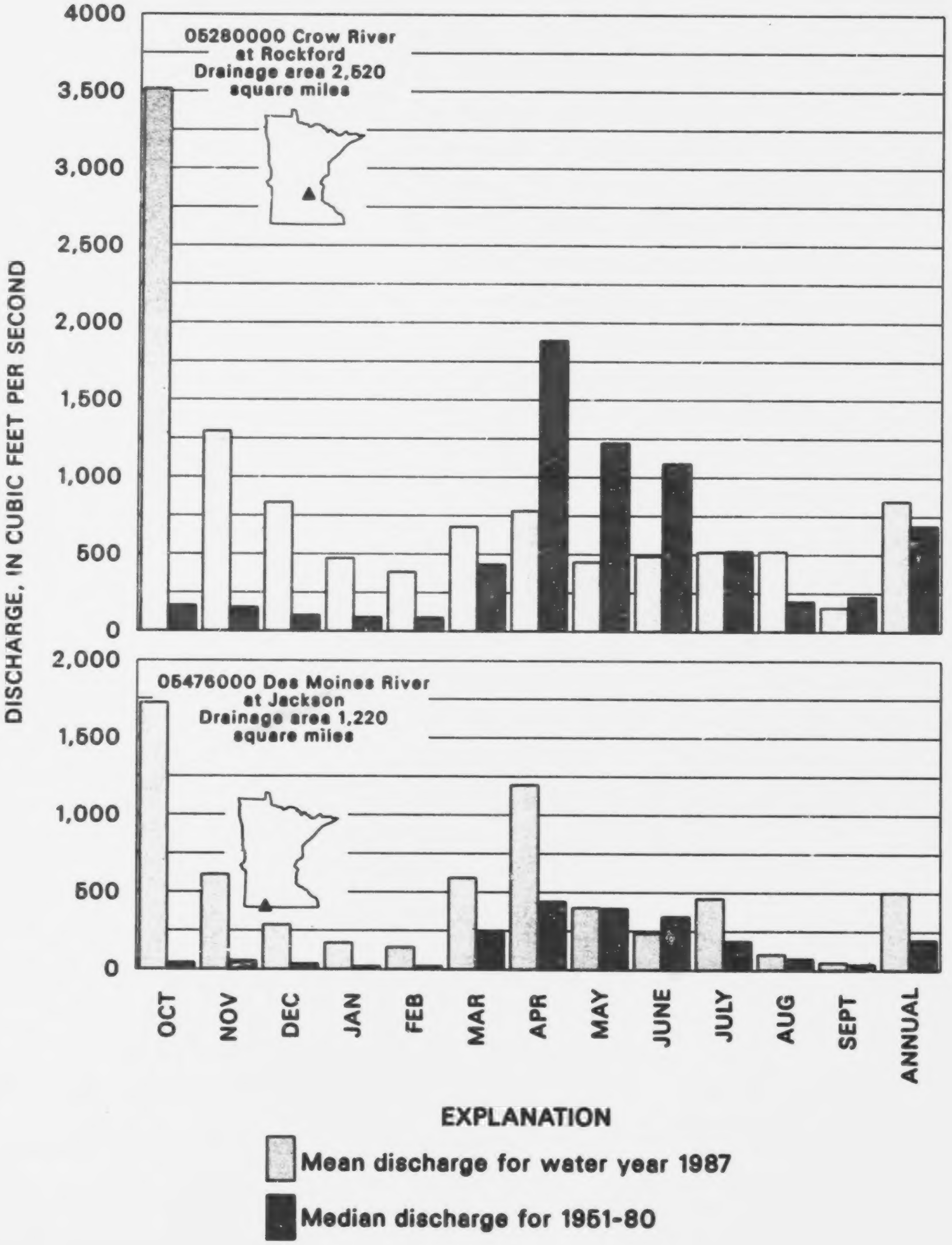


Figure 2.--Comparison of mean discharge for the 1987 water year with median



discharge for 1951-80 at four long-term representative gaging stations.

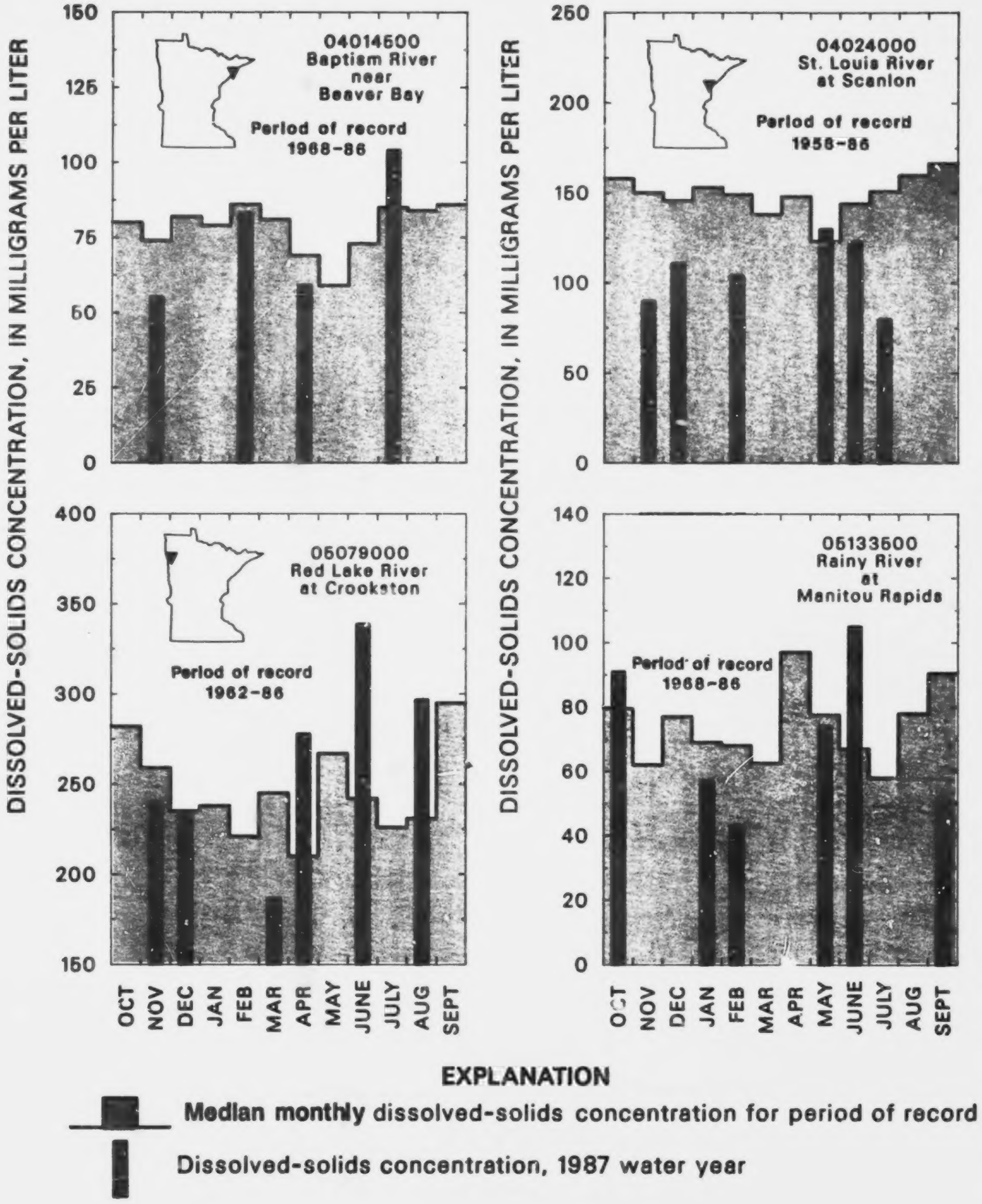


FIGURE 3.--Comparisons between dissolved-solids concentrations.

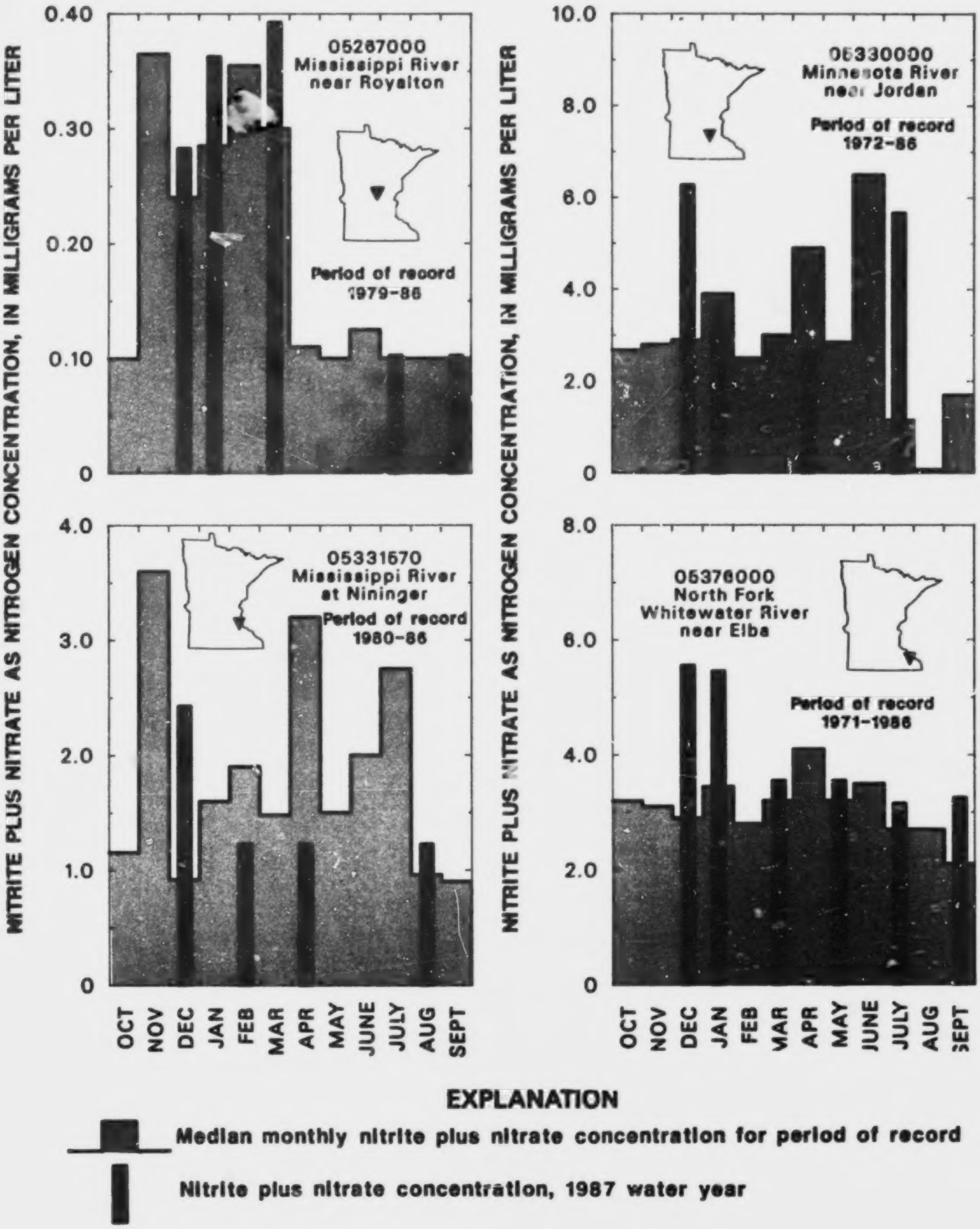
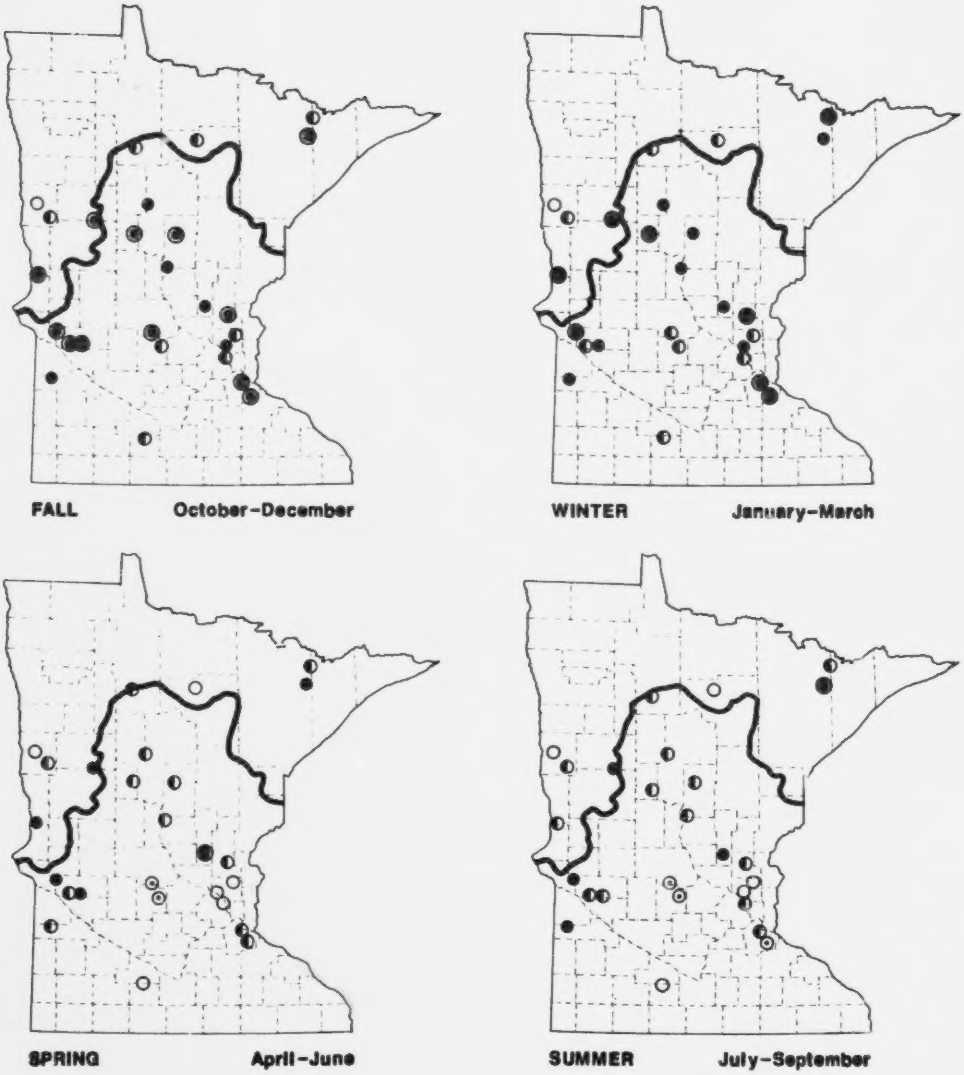


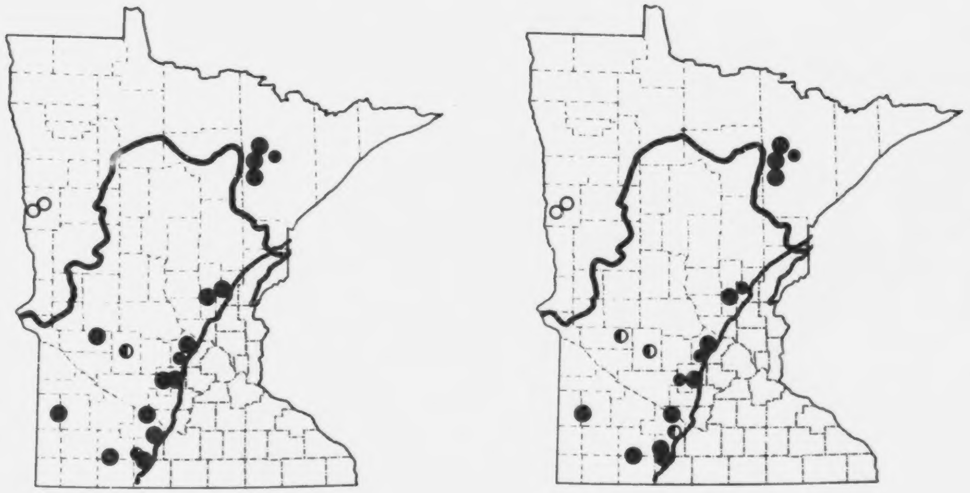
FIGURE 4.--Comparisons between nitrite plus nitrate concentrations.


FALL
October-December
WINTER
January-March
SPRING
April-June
SUMMER
July-September

EXPLANATION

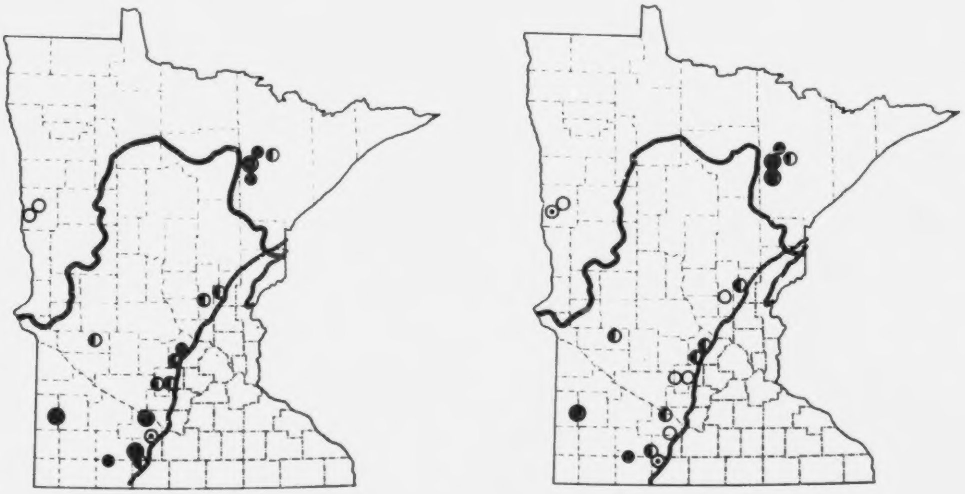
- ● New record monthly high
- • Above normal - Water levels are within the highest 25 percent of record for the season
- ◐ Normal - Water levels are within the middle 50 percent of record for the season
- ○ Below normal - Water levels are within the lowest 25 percent of record for the season
- ◉ New record monthly low
- ——— Boundary between Volume I and II

FIGURE 5.--Relation of seasonal water-table levels to long-term normal levels.



FALL October-December

WINTER January-March



SPRING April-June

SUMMER July-September

EXPLANATION

● New record monthly high

• Above normal - Water levels are within the highest 25 percent of record for the season

◐ Normal - Water levels are within the middle 50 percent of record for the season

○ Below normal - Water levels are within the lowest 25 percent of record for the season

⊗ New record monthly low

——— Boundary between Volume I and II

▭ Cretaceous and crystalline Precambrian aquifers

▭ Hollandale embayment: data shown on Figure 6b

FIGURE 6a.--Relation of seasonal water levels to long-term normal levels in Cretaceous and crystalline Precambrian aquifers.

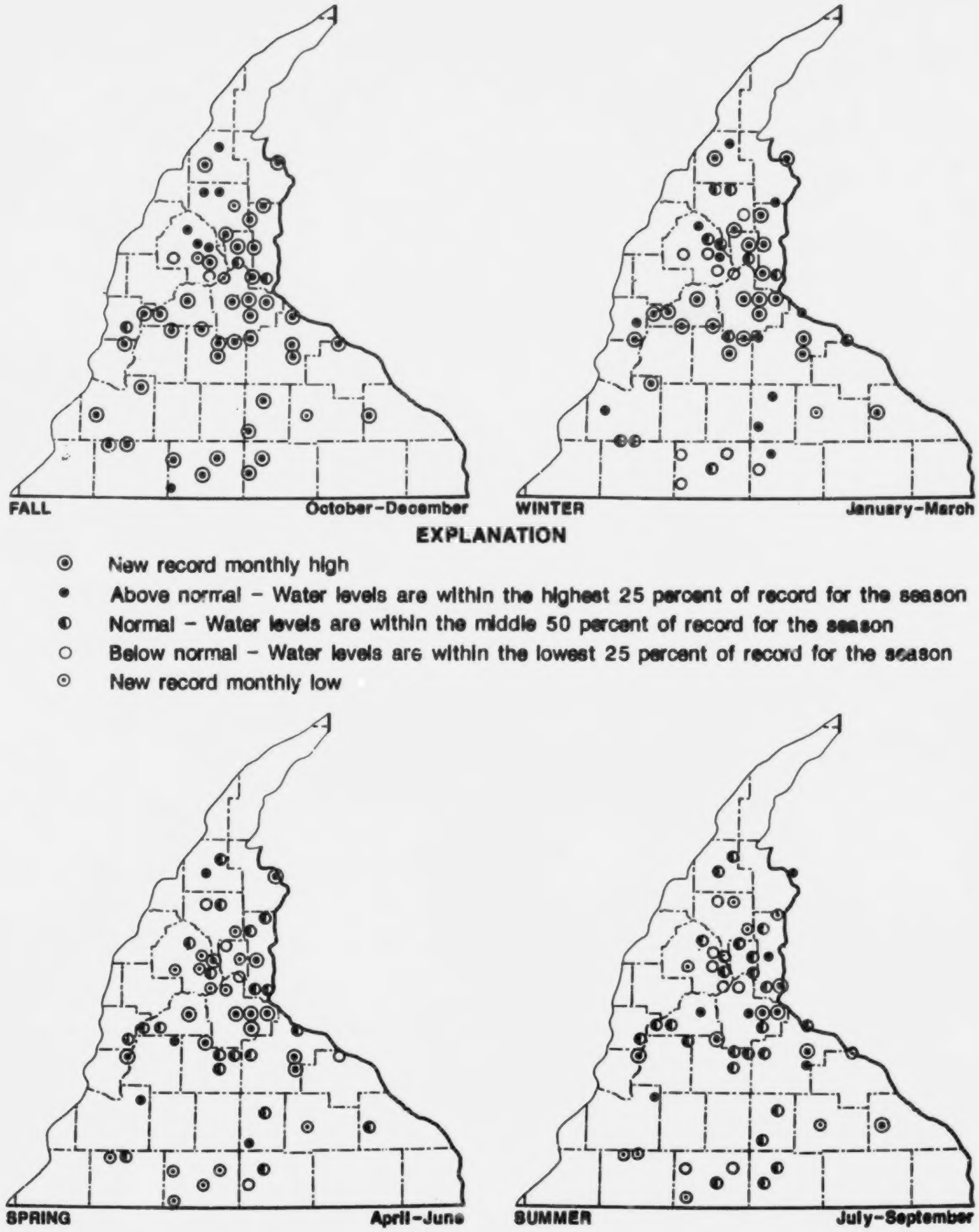

FALL
October-December
WINTER
January-March
EXPLANATION
◎ New record monthly high
● Above normal - Water levels are within the highest 25 percent of record for the season
◐ Normal - Water levels are within the middle 50 percent of record for the season
○ Below normal - Water levels are within the lowest 25 percent of record for the season
⊙ New record monthly low
SPRING
April-June
SUMMER
July-September

FIGURE 6b.--Relation of seasonal water levels to long-term normal levels in the Paleozoic and late Precambrian aquifers in the Hollandale embayment.

In the seven-county metropolitan area, the primary pumping center of the State, water levels in the Prairie du Chien-Jordan bedrock aquifer (fig. 6b) were at all time record monthly highs in many wells during October-December. Water levels in 18 of the 27 wells monitored, or 67 percent, were at record-high levels during this period. Water levels in eight of these same wells also were at record monthly highs for April through June. Water levels in 15 of the 18 wells remained normal or above normal for the entire year. Water levels in 6 of the 27 well monitored in this formation were below normal for the entire year. These wells are located close to municipal pumping centers. Between April and June, water levels in nine wells were at new record monthly lows because of increased pumping from the Prairie du Chien-Jordan aquifer. A record monthly low level was recorded in a well at Lake Minnetonka west of Minneapolis that was 3 feet lower than the lowest level that occurred during water year 1986.

In the deeper Mount Simon-Hinckley bedrock aquifer, 10 of 16 wells located in the central and east-central parts of the State (fig. 6b) were below normal, and levels and nine of them were at record seasonal lows by the end of the water year. Water levels in five wells in the Minneapolis-St. Paul area were consistently 2-3 feet lower than they were in water year 1986. Record-high water levels were recorded in one well in east-central Minnesota from October through May. Water levels in six wells located in outlying areas surrounding the Twin Cities were normal or above normal for the year. However, these wells are far removed from pumping centers.

Water levels in 91 percent of wells monitored in all bedrock aquifers outside the seven-county metropolitan area including wells in the southeast, south-central, and east-central parts of the State were above normal during October-December. Water levels in 27 percent of the wells were at record monthly highs. During January-March, levels in 64 percent of the wells were normal or above normal. However, for April-June water levels in 27 percent of the wells were at record monthly lows, including six wells in south-central Minnesota near the Iowa border. For the summer months of July-September, water levels in 45 percent of the wells were below normal; record monthly lows were recorded in the six wells near the Iowa border throughout the summer. Water levels in a well at Rochester, a major pumping center in southeastern Minnesota, were at record monthly lows throughout the entire year.

SPECIAL NETWORKS AND PROGRAMS

Hydrologic Bench-Mark Network is a network of 57 sites in small drainage basins around the country whose purpose is to provide consistent data on the hydrology, including water quality, and related factors in representative undeveloped watersheds nationwide, and to provide analyses on a continuing basis to compare and contrast conditions observed in basins more obviously affected by the activities of man.

National Stream Quality Accounting Network (NASQAN) is a national data-collection network designed by the U.S. Geological Survey to meet many of the information needs of government agencies and other groups involved in natural or regional water-quality planning and management. The 500 or so sites in NASQAN are generally located at the downstream ends of the hydrologic accounting units designated by the U.S. Geological Survey Office of Water Data Coordination in consultation with the Water Resources Council. The objectives of NASQAN are (1) to obtain information on the quality and quantity of water moving within and from the United States through a systematic and uniform process of data collection, summarization, analysis, and reporting such that the data may be used for, (2) description of the areal variability of water quality in the Nation's rivers through analysis of data from this and other programs, (3) detection of changes or trends with time in the pattern of occurrence of water-quality characteristics, and (4) providing a nationally consistent data base useful for water quality assessment and hydrologic research.

The National Trends Network (NTN) is a 150-station network for sampling atmospheric deposition in the United States. The purpose of the network is to determine the variability, both in location and in time, of the composition of atmospheric deposition, which includes snow, rain, dust particles, and aerosols, and gases. The core from which the NTN was built was the already-existing deposition-monitoring network of the National Atmospheric Deposition Program (NADP).

Radiochemical program is a network of regularly sampled water-quality stations where samples are collected to be analyzed for radioisotopes. The streams that are sampled represent major drainage basins in the conterminous United States.

Tritium network is a network of stations which has been established to provide baseline information on the occurrence of tritium in the Nation's surface waters. In addition to the surface-water stations in the network, tritium data are also obtained at a number of precipitation stations. The purpose of the precipitation stations is to provide an estimate sufficient for hydrologic studies of the tritium input to the United States.

EXPLANATION OF THE RECORDS

The surface-water and ground-water records published in this report are for the 1987 water year that began October 1, 1986, and ended September 30, 1987. A calendar of the water year is provided on the inside of the front cover. The records contain streamflow data, stage and content data for lakes and reservoirs, water-quality data for the surface and ground water, and ground-water-level data. The locations of the stations and wells where the data were collected are shown in figures 8, 9, 10, and 11. The following sections of the introductory text are presented to provide users with a more detailed explanation of how the hydrologic data published in this report were collected, analyzed, computed, and arranged for presentation.

STATION IDENTIFICATION NUMBERS

Each data station, whether streamsite or well, in this report is assigned a unique identification number. This number is unique in that it applies specifically to a given station and to no other. The number usually is assigned when a station is first established and is retained for that station indefinitely. The system used by the U.S. Geological Survey to assign identification numbers for surface-water stations and for ground-water well sites differ, but both are based on geographic location. The "downstream order" system is used for regular surface-water stations and the "latitude-longitude" system is used for wells and, in Minnesota, for surface-water stations where only miscellaneous measurements are made.

Downstream Order System and Station Number

Since October 1, 1950, the order of listing hydrologic-station records in Survey reports is in a downstream direction along the main stream. All stations on a tributary entering upstream from a main-stream station are listed before that station. A station on a tributary that enters between two main-stream sections is listed between them. A similar order is followed by listing stations on first rank, second rank, and other ranks of tributaries. The rank of any tributary on which a station is situated with respect to the stream to which it is immediately tributary is indicated by an indentation in a list of stations in front of the report. Each indention represents one rank. This downstream order and system of indention show which stations are on tributaries between any two stations and the rank of the tributary on which each station is situated.

As an added means of identification, each hydrologic station and partial-record station has been assigned a station number. These are in the same downstream order in this report. In assigning station numbers, no distinction is made between partial-record stations and other stations; therefore, the station number for a partial-record station indicates downstream-order position in a list made up of both types of stations. Gaps are left in the series of numbers to allow for new stations that may be established; hence, the numbers are not consecutive. The complete 8-digit number for each station such as 05041000, which appears just to the left of the station name, includes the 2-digit part number "05" plus the 6-digit downstream order number "041000."

Latitude-Longitude System for Wells and Miscellaneous Sites

The 8-digit downstream order station numbers are not assigned to wells and miscellaneous sites where only random water-quality samples or discharge measurements are taken.

The well and miscellaneous site numbering system of the U.S. Geological Survey is based on the grid system of latitude and longitude. The system provides the geographic location of the well or miscellaneous site and a unique number for each site. The number consists of 15 digits. The first 6 digits denote the degrees, minutes, and seconds of latitude, the next 7 digits denote degrees, minutes, and seconds of longitude, and the last 2 digits (assigned sequentially) identify the wells or other sites within a 1-second grid. See figure 7 below. Each well site is also identified by a local well number which consists of township, range, and section numbers, three letters designating 1/4, 1/4, 1/4 section location, and a two-digit sequential number.

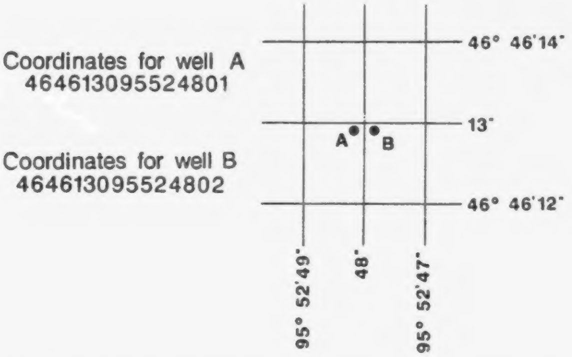


Figure 7.--Example of system for numbering wells and miscellaneous sites

RECORDS OF STAGE AND WATER DISCHARGE

Records of stage and water discharge may be complete or partial. Complete records of discharge are those obtained using a continuous stage-recording device through which either instantaneous or mean daily discharge may be computed for any time, or any period of time, during the period of record. Complete records of lake or reservoir content, similarly, are those for which stage or content may be computed or estimated with reasonable accuracy for any time, or period of time. They may be obtained using a continuous stage-recording device, but need not be. Because daily mean discharges and end-of-day contents commonly are published for such stations, they are referred to as "daily stations".

By contrast, partial records are obtained through discrete measurements without using a continuous stage-recording device and pertain only to a few flow characteristics, or perhaps only one. The nature of the partial record is indicated by table titles such as "High-flow partial records," or "Low-flow partial records." Records of miscellaneous discharge measurements or of measurements from special studies, such as low-flow seepage studies, may be considered as partial records, but they are presented separately in this report. Location of all complete-record and high-flow partial-record stations for which data are given in this report are shown in figures 8 and 10.

Data Collection and Computation

The data obtained at a complete-record gaging station on a stream or canal consist of a continuous record of stage, individual measurements of discharge throughout a range of stages, and notations regarding factors that may affect the relationships between stage and discharge. These data, together with supplemental information, such as weather records, are used to compute daily discharges. The data obtained at a complete-record gaging station on a lake or reservoir consist of a record of stage and of notations regarding factors that may affect the relationship between stage and lake content. These data are used with stage-area and stage-capacity curves or tables to compute water-surface areas and lake storage.

Daily mean discharges are computed by applying the daily mean stages (gage heights) to the stage-discharge curves or tables. If the stage-discharge relation is subject to change because of frequent or continual change in the physical features that form the control, the daily mean discharge is determined by the shifting-control method, in which correction factors based on the individual discharge measurements and notes of the personnel making the measurements are applied to the gage heights before the discharges are determined from the curves or tables. This shifting- control method also is used if the stage-discharge relation is changed temporarily because of aquatic growth or debris on the control. For some stations, formation of ice in the winter may so obscure the stage-discharge relations that daily mean discharges must be estimated from other information such as temperature and precipitation records, notes of observations, and records for other stations in the same or nearby basins for comparable periods.

At some stream-gaging stations the stage-discharge relation is affected by the backwater from reservoirs, tributary streams, or other sources. This necessitates the use of the slope method in which the slope or fall in a reach of the stream is a factor in computing discharge. The slope or fall is obtained by means, of an auxiliary gage set at some distance from the base gage. At some stations the stage-discharge relation is affected by changing stage; at these stations the rate of change in stage is used as a factor in computing discharge.

In computing records of lake or reservoir contents, it is necessary to have available from surveys, curves, or tables defining the relationship of stage and content. The application of stage to the stage-content curves or tables gives the contents from which daily, monthly, or yearly changes then are determined. If the stage-content relationship changes because of deposition of sediment in a lake or reservoir, periodic resurveys may be necessary to redefine the relationship. Even when this is done, the contents computed may become increasingly in error as time since the last survey increases. Discharge over lake or reservoir spillways are computed from stage-discharge relationships much as other stream discharges are computed.

For some gaging stations there are periods when no gage-height record is obtained, or the recorded gage height is so faulty that it cannot be used to compute daily discharge or contents. This happens when the recorder stops or otherwise fails to operate properly, intakes are plugged, the float is frozen in the well, or for various other reasons. For such periods, the daily discharges are estimated from the recorded range in stage, previous or following record, discharge measurements, weather records, and comparison with other station records from the same or nearby basins. Likewise, daily contents may be estimated from operator's logs, previous or following record, inflow-outflow studies, and other information. Information explaining how estimated daily-discharge values are identified in station records is included in the next two sections, "Data Presentation" (REMARKS paragraph) and "Identifying Estimated Daily Discharge."

Data Presentation

The records published for each gaging station consist of two parts, the manuscript or station description and the data table for the current water year. The manuscript provides, under various headings, descriptive information, such as station location; period of record; average discharge; historical extremes; record accuracy; and other remarks pertinent to station operation and regulation. The following information as appropriate is provided with each continuous record of discharge or lake content. Comments to follow clarify information presented under the various headings of the station description.

LOCATION.--Information on locations is obtained from the most accurate maps available. The location of the gage with respect to the cultural and physical features in the vicinity and with respect to the reference place mentioned in the station name is given. River mileages, given for only a few stations, were determined by methods given in "River Mileage Measurement," Bulletin 14, Revision of October 1968, prepared by the Water Resources Council or were provided by the U.S. Army Corps of Engineers.

DRAINAGE AREA.--Drainage areas are measured using the most accurate maps available. Because the type of maps available varies from one drainage basin to another, the accuracy of drainage areas likewise varies. Drainage areas are updated as better maps become available.

PERIOD OF RECORD.--This indicates the period for which there are published records for the station or for an equivalent station. An equivalent station is one that was in operation at a time when the present station was not, and whose location was such that records from it can reasonably be considered equivalent with records from the present station.

REVISED RECORDS.--Published records, because of new information, occasionally are found to be incorrect, and revisions are printed in later reports. Listed under this heading are all reports in which revisions have been published for the station and water years to which the revisions apply. If a revision did not include daily, monthly, or annual figures of discharge, that fact is noted after the year dates as follows: "(M)" means that only the instantaneous maximum discharge was revised; "(m)" that only the instantaneous minimum was revised; and "(P)" that only peak discharges were revised. If the drainage area has been revised, the report in which the most recently revised figure was first published is given.

GAGE.--The type of gage in current use, the datum of the current gage referred to National Geodetic Vertical Datum of 1929 (see glossary), and a condensed history of the types, locations, and datum of previous gages are given under this heading.

REMARKS.--All periods of estimated daily-discharge record will either be identified by date in this paragraph of the station description for water-discharge stations or flagged in the daily-discharge table. If a remarks statement is used to identify estimated record, the paragraph will begin with this information presented as the first entry. The paragraph is also used to present information relative to the accuracy of the records, to special methods of computation, to conditions that affect natural flow at the station and, possibly, to other pertinent items. For reservoir stations, information is given on the dam forming the reservoir, the capacity, outlet works and spillway, and purpose and use of the reservoir.

COOPERATION.--Records provided by a cooperating organization or obtained for the Geological Survey by a cooperating organization are identified here.

AVERAGE DISCHARGE.--The discharge value given is the arithmetic mean of the water-year mean discharges. It is computed only for stations having at least 5 water years of complete record, and only water years of complete record are included in the computation. It is not computed for stations where diversions, storage, or other water-use practices cause the value to be meaningless. If water developments significantly altering flow at a station are put into use after the station has been in operation for a period of years, a new average is computed as soon as 5 water years of record have accumulated following the development. The median of yearly mean discharges also is given under this heading for stations having 10 or more water years of record, if the median differs from the average given by more than 10 percent.

EXTREMES FOR PERIOD OF RECORD.--Extremes may include maximum and minimum stages and maximum and minimum discharges or content. Unless otherwise qualified, the maximum discharge or content is the instantaneous maximum corresponding to the highest stage that occurred. The highest stage may have been obtained from a graphic or digital recorder, a crest-stage gage, or by direct observation of a nonrecording gage. If the maximum stage did not occur on the same day as the maximum discharge or content, it is given separately. Similarly, the minimum is the instantaneous minimum discharge, unless otherwise qualified, and was determined and is reported in the manner as the maximum.

EXTREMES OUTSIDE PERIOD OF RECORD.--Included here is the information concerning major floods or unusually low flows that occurred outside the stated period of record. The information may or may not have been obtained by the U.S. Geological Survey.

EXTREMES FOR THE CURRENT YEAR.--Extremes given here are similar to those for the period of record, except the peak discharge listing which may include secondary peaks. For stations meeting certain criteria, all peak discharges and stages occurring during the water year and greater than a selected base discharge are presented under this heading. The peaks greater than the base discharge, excluding the highest one, are referred to as secondary peaks. Peak discharges are not published for canals, ditches, drains, or streams for which the peaks are subject to substantial control by man. The time of occurrence for peaks is expressed in 24-hour local standard time. For example, 12:30 a.m. is 0030, and 1:30 p.m. is 1330. The minimum for the current water year appears below the table of peak data.

REVISIONS.--If a critical error in published records is discovered, a revision is included in the first report published following discovery of the error.

Although rare, occasionally the records of a discontinued gaging station may need revision. Because, for these stations, there would be no current or, possibly, future station manuscript published to document the revision in a "Revised Records" entry, users of data for these stations who obtained the record from previously published data reports may wish to contact the District office to determine if the published records were ever revised after the station was discontinued. Of course, if the data were obtained by computer retrieval, the data would be current and there would be no need to check because any published revision of data is always accompanied by revision of the corresponding data in computer storage.

For most gaging stations on lakes and reservoirs the data presented comprise a description of the station and a monthly summary table of stage and contents. For some reservoirs a table showing daily contents or stage is given.

The daily table for stream-gaging stations gives mean discharge for each day and is followed by monthly and yearly summaries. In the monthly summary below the daily table, the line headed "TOTAL" gives the sum of the daily figures. The line headed "MEAN" gives the average flow in cubic feet per second during the month. The lines headed "MAX" and "MIN" give the maximum and minimum daily discharges, respectively, for the month. Discharge for the month also is usually expressed in cubic feet per second per square mile (line headed "CFSM"), or in inches (line headed "IN."), or in acre-feet (line headed "AC-FT"). Figures for cubic feet per second per square mile and runoff in inches are omitted if there is extensive regulation or diversion or if the drainage area includes large noncontributing areas. In the yearly summary below the monthly summary, the figures shown are the appropriate discharges for the calendar and water years. At some stations monthly and (or) yearly observed discharges are adjusted for reservoir storage or diversion, or diversions or reservoir contents are given. These figures are identified by a symbol and corresponding footnote.

Data collected at partial-record stations follow the information for continuous-record sites. Data for partial-record discharge stations are presented in two tables. The first is a table of discharge measurements at low-flow partial-record stations, and the second is a table of annual maximum stage and discharge at crest-stage stations. The tables of partial-record stations are followed by a listing of discharge measurements made at sites other than continuous-record or partial-record stations. These measurements are generally made in times of drought or flood to give better areal coverage to those events. Those measurements and others collected for some special reason are called measurements at miscellaneous sites.

Identifying Estimated Daily Discharge

Estimated daily-discharge values published in the water-discharge tables of annual State data reports are identified either by flagging individual daily values with the letter symbol "e" and printing a table footnote, "e Estimated", or by listing the dates of the estimated record in the REMARKS paragraph of the station description.

Accuracy of the Records

The accuracy of streamflow records depends primarily on: (1) The stability of the stage-discharge relation or, if the control is unstable, the frequency of discharge measurements; and (2) the accuracy of measurements of stage, measurements of discharge, and interpretation of records.

The accuracy attributed to the records is indicated under "REMARKS." "Excellent" means that about 95 percent of the daily discharges are within 5 percent of the true; "good," within 10 percent; and "fair," within 15 percent. Records that do not meet the criteria mentioned, are rated "poor." Different accuracies may be attributed to different parts of a given record.

Daily mean discharges in this report are given to the nearest hundredth of a cubic foot per second for values less than 1 ft^3/s; to the nearest tenth between 1.0 and 10 ft^3/s; to whole numbers between 10 and 1000 ft^3/s; and to 3 significant figures for more than 1000 ft^3/s. The number of significant figures used is based solely on the magnitude of the discharge value. The same rounding rules apply to discharges listed for partial-record stations and miscellaneous sites.

Discharge at many stations, as indicated by the monthly mean, may not reflect natural runoff due to the effects of diversion, consumption, regulation by storage, increase or decrease in evaporation due to artificial causes, or to other factors. For such stations, figures of cubic feet per second per square mile and of runoff, in inches, are not published unless satisfactory adjustments can be made for diversions, for changes in contents of reservoirs, or for other changes incident to use and control. Evaporation from a reservoir is not included in the adjustments for changes in reservoir contents, unless it is so stated. Even at those stations where adjustments are made, large errors in computed runoff may occur if adjustments or losses are large in comparison with the observed discharge.

Other Records Available

Information of a more detailed nature than that published for most of the gaging stations such as observations of water temperatures, discharge measurements, gage-height records, and rating tables is on file in the district office. Also most gaging-station records are available in computer-usable form and many statistical analyses have been made.

Information on the availability of unpublished data or statistical analyses may be obtained from the district office.

The National Water Data Exchange, Water Resources Division, U.S. Geological Survey, National Center, Reston, VA 22092, maintains an index of all discharge measurement sites in the State as well as an index of records of discharge collected by other agencies but not published by the Geological Survey. Information on records available at specific sites can be obtained upon request.

RECORDS OF SURFACE-WATER QUALITY

Records of surface water quality ordinarily are obtained at or near stream-gaging stations because interpretation of records of surface-water quality nearly always requires corresponding discharge data. Records of surface-water quality in this report may involve a variety of types of data and measurement frequencies.

Classification of Records

Water-quality data for surface-water sites are grouped into one of three classifications. A continuing-record station is a site where data are collected on a regularly scheduled basis. Frequency may be once or more times daily, weekly, monthly, or quarterly. A partial-record station is a site where limited water-quality data are collected systematically over a period of years. Frequency of sampling is usually less than quarterly. A miscellaneous sampling site is a location other than a continuing or partial-record station, where random samples are collected to give better areal coverage to define water-quality conditions in the river basin.

A careful distinction needs to be made between "continuing records" as used in this report and "continuous recordings," which refers to a continuous graph or a series of discrete values punched at short intervals on a paper tape. Some records of water quality, such as temperature and specific conductance, may be obtained through continuous recordings; however, because of costs, most data are obtained only monthly or less frequently. Locations of stations for which records on the quality of surface water appear in this report are shown in figure 10.

Arrangement of Records

Water-quality records collected at a surface-water daily record station are published immediately following that record, regardless of the frequency of sample collection. Station number and name are the same for both records. Where a surface-water daily record station is not available or where the water quality differs significantly from that at the nearby surface-water station, the continuing water-quality record is published with its own station number and name in the regular downstream-order sequence. Water-quality data for partial-record stations and for miscellaneous sampling sites appear in separate tables following the table of discharge measurements at miscellaneous sites.

Onsite Measurement and Collection

In obtaining water quality data, a major concern needs to be assuring that the data obtained represents the in situ quality of water. To assure this, certain measurements, such as water temperature, pH, and dissolved oxygen need to be made onsite when the samples are taken. To assure that measurements made in the laboratory also represent the in situ water, carefully prescribed procedures need to be followed in collecting the samples, in treating the samples to prevent changes in quality pending analysis, and in shipping the samples to the laboratory. Procedures for onsite measurements and for collecting, treating, and shipping samples are given in publications on "Techniques of Water-Resources Investigations," Book 1, Chap. D2; Book 3, Chap. C2; Book 5 Chap. A1, A3, and A4. All of these references are listed on p. 17 of this report. Also, detailed information on collecting, treating, and shipping samples may be obtained from the Geological Survey District office.

One sample can define adequately the water quality at a given time if the mixture of solutes throughout the stream cross section is homogeneous. However, the concentration of solutes at different locations in the cross section may vary widely with different rates of water discharge, depending on the source of material and the turbulence and mixing of the stream. Some streams must be sampled through several vertical sections to obtain a representative sample needed for an accurate mean concentration and for use in calculating load. All samples obtained for the National Stream Quality Accounting Network (see definitions) are obtained from at least several verticals. Whether samples are obtained from the centroid of flow or from several verticals, depends on flow conditions and other factors which must be evaluated by the collector.

Chemical-quality data published in this report are considered to be the most representative values available for the stations listed. The values reported represent water-quality conditions at the time of sampling as much as possible, consistent with available sampling techniques and methods of analysis. In the rare case where an apparent inconsistency exists between a reported pH value and the relative abundance of carbon dioxide species (carbonate and bicarbonate), the inconsistency is the result of a slight uptake of carbon dioxide from the air by the sample between measurement of pH in the field and determination of carbonate and bicarbonate in the laboratory.

For chemical-quality stations equipped with digital monitors, the records consist of daily maximum, minimum, and mean values for each constituent measured and are based upon hourly punches beginning at 0100 hours and ending at 2400 hours for the day of record. More detailed records (hourly values) may be obtained from the U.S.G.S. district office whose address is given on the back of the title page of this report.

Water Temperature

Water temperatures are measured at most of the water-quality stations. In addition, water temperatures are taken at time of discharge measurements for water-discharge stations. For stations where water temperatures are taken manually once or twice daily, the water temperatures are taken at about the same time each day. Large streams have a small diurnal temperature change; shallow streams may have a daily range of several degrees and may follow closely the changes in air temperature. Some streams may be affected by waste-heat discharges.

At stations where recording instruments are used, either mean temperatures or maximum and minimum temperatures for each day are published. Water temperatures measured at the time of water-discharge measurements are on file in the District office.

Sediment

Suspended-sediment concentrations are determined from samples collected by using depth-integrating samplers. Samples usually are obtained at several verticals in the cross section, or a single sample may be obtained at a fixed point and a coefficient applied to determine the mean concentration in the cross sections.

During periods of rapidly changing flow or rapidly changing concentration, samples may have been collected more frequently (twice daily or, in some instances, hourly). The published sediment discharges for days of rapidly changing flow or concentration were computed by the subdivided-day method (time-discharge weighted average). Therefore, for those days when the published sediment discharge value differs from the value computed as the product of discharge times mean concentration times 0.0027, the reader can assume that the sediment discharge for that day was computed by the subdivided-day method. For periods when no samples were collected, daily loads of suspended sediment were estimated on the basis of water discharge, sediment concentrations observed immediately before and after the periods, and suspended-sediment loads for other periods of similar discharge.

At other stations, suspended-sediment samples were collected periodically at many verticals in the stream cross section. Although data collected periodically may represent conditions only at the time of observations, such data are useful in establishing seasonal relations between quality and streamflow and in predicting long-term sediment-discharge characteristics of the stream.

In addition to the records of suspended sediment discharge, records of the periodic measurements of the particle-size distribution of the suspended sediment and bed material are included for some stations.

Laboratory Measurements

Samples for indicator bacteria and specific conductance are analyzed locally. All other samples are analyzed in the Geological Survey laboratories in Arvada, Colo., Doraville, Ga., or Iowa City, Ia. Methods used in analyzing sediment samples and computing sediment records are given in TWRI, Book 5, Chap. C1. Methods used by the Geological Survey laboratories are given in TWRI, Book 1, Chap. D2; Book 3, Chap. C2; Book 5, Chap. A1, A3, and A4.

Data Presentation

For continuing-record stations, information pertinent to the history of station operation is provided in descriptive headings preceding the tabular data. These descriptive headings give details regarding location, drainage area, period of record, type of data available, instrumentation, general remarks, cooperation, and extremes for parameters currently measured daily. Tables of chemical, physical, biological, radiochemical data, and so forth, obtained at a frequency less than daily are presented first. Tables of "daily values" of specific conductance, pH, water temperature, dissolved, and suspended sediment then follow in sequence.

In the descriptive headings, if the location is identical to that of the discharge gaging station, neither the LOCATION nor the DRAINAGE AREA statements are repeated. The following information, when appropriate, is provided with each continuous-record station. Comments that follow clarify information presented under the various headings of the station description.

LOCATION.--See Data Presentation under "Records of stage and Water Discharge"; same comments apply.

DRAINAGE AREA.--See Data Presentation under "Records of stage and Water Discharge"; same comments apply.

RECORD OF RECORD.--This indicates the periods for which there are published water-quality records for the station. The periods are shown separately for records of parameters measured daily or continuously and those measured less than daily. For those measured daily or continuously, periods of record are given for the parameters individually.

INSTRUMENTATION.--Information on instrumentation is given only if a water-quality monitor, temperature recorder, sediment pumping sampler, or other sampling device is in operation at a station.

REMARKS.--Remarks provide added information pertinent to the collection, analysis, or computation of the records.

COOPERATION.--Records provided by a cooperating organization or obtained for the Geological Survey by a cooperating organization are identified here.

EXTREMES.--Maximums and minimums are given only for parameters measured daily or more frequently. None are given for parameters measured weekly or less frequently , because the true maximums or minimums may not have been sampled. Extremes, when given, are provided for both the period of record and for the current water year.

REVISIONS.--If errors in published water-quality records are discovered after publication, appropriate updates are made to the Water-Quality File in the U.S. Geological Survey's computerized data system, WATSTORE, and subsequently by monthly transfer of update transactions to the U.S. Environmental Protection Agency's STORET system. Because the usual volume of updates makes it impractical to document individual changes in the State data-report series or elsewhere, potential users of U.S. Geological Survey water-quality data are encouraged to obtain all required data from the appropriate computer file to insure the most recent updates.

The surface-water-quality records for partial-record stations and miscellaneous sampling sites are published in separate tables following the table of discharge measurements at miscellaneous sites. No descriptive statements are given for these records. Each station is published with its own station number and name in the regular downstream-order sequence.

Remark Codes

The following remark codes may appear with the water-quality data in this report:

PRINTED OUTPUT	REMARK
E	Estimated value
>	Actual value is known to be greater than the value shown
<	Actual value is known to be less than the value shown
K	Results based on colony count outside the acceptance range (non-ideal colony count)
L	Biological organisms count less than 0.5 percent (organisms may be observed rather than counted)
D	Biological organism count equal to or greater than 15 percent (dominant)
&	Biological organism estimated as dominant

RECORDS OF GROUND-WATER LEVELS

Only water-level data from a national network of observation wells are given in this report. These data are intended to provide a sampling and historical record of water-level changes in the Nation's most important aquifers. Locations of the observation wells in this network in Minnesota are shown in figure 11.

Although, in this report, records of water levels are presented for fewer than 200 wells, records are obtained through cooperative efforts of many Federal, State, and local agencies for several hundred observation wells throughout Minnesota and are placed in computer storage. Each spring, the Minnesota Department of Natural Resources, Division of Waters publishes a report for the previous water year entitled "Observation Well Data Summary, Water Year 19__." This report contains hydrographs of recorder wells, detailed maps showing the location of active observation wells, and other useful items. Information about the availability of the data in the water-level file may be obtained from the District Chief, Minnesota District. (See address on back of front page).

Data Collection and Computation

Measurements of water levels are made in many types of wells under varying conditions, but the methods of measurement are standardized to the extent possible. The equipment and measuring techniques used at each observation well assure that measurements at each well are of consistent accuracy and reliability.

Tables of water-level data are presented by counties arranged in alphabetical order. The prime identification number for a given well is the 15-digit number that appears in the upper left corner of the table. The secondary identification number is the local well number, an alphanumeric number, derived from the township-range location of the well.

Water-level records are obtained from direct measurements with a steel tape, pressure gage or from the graph or punched tape of a water-level recorder. The water-level measurements in this report are given in feet with reference to land-surface datum (lsd). Land-surface datum is a datum plane that is approximately at land surface at each well. If known, the elevation of the land-surface datum is given in the well description. The height of the measuring point (MP) above or below land-surface datum is given in each well description. Water levels in wells equipped with recording gages are reported for every fifth day and the end of each month (eom).

All water-level measurements are reported to the nearest hundredth of a foot. The error of water-level measurements is normally only a hundredth or a few hundredth of a foot.

Hydrographs showing water-level fluctuations are included for 102 representative wells; 67 bedrock, 20 surficial-sand, and 15 buried-sand wells.

Data Presentation

Each well consists of two parts, the station description and the data table of water levels observed during the water year. The description of the well is presented first through use of descriptive headings preceding the tabular data. The comments to follow clarify information presented under the various headings.

LOCATION.--This paragraph follows the well-identification number and reports the latitude and longitude (given in degrees, minutes and seconds); a landline location designation; the hydrologic-unit number; the distance and direction from a geographic point of reference; and the owner's name.

AQUIFER.-- This entry designates by name(if a name exists) and geologic age the aquifer(s) open to the well.

WELL CHARACTERISTICS.--This entry describes the well in terms of depth, diameter, casing depth and/or screened interval, method of construction, use, and includes additional information such as casing breaks, collapsed screen, and other changes since construction.

DATUM.--This entry describes both the measuring point and the land-surface elevation at the well. The measuring point is described physically (such as top of collar, notch in the top of casing, plug in pump base and so on), and in relation to land surface (such as 1.3 ft above land-surface datum). The elevation of the land-surface datum is described in feet above (or below) National Geodetic Vertical Datum of 1929 (NGVD of 1929); it is reported with a precision depending on the method of determination.

REMARKS.--This entry describes factors that may influence the water level in a well or the measurement of the water level. It should identify wells that are also water-quality observation wells, and may be used to acknowledge the assistance of local (non-Survey) observers.

PERIOD OF RECORD.--This entry indicates the period for which there are published records for the well. It reports the month and year of the start of the publication of water-level records by the U.S. Geological Survey and the words "to current year" if the records are to be continued into the following year. Periods for which water-level records are available, but are not published by the Geological Survey, may be noted.

EXTREMES FOR THE PERIOD OF RECORD.--This entry contains the highest and lowest water levels of the period of published record, with respect to land-surface datum, and the dates of their occurrence.

A table of water levels follows the station description for each well. Water levels are reported in feet below land-surface datum and all taped measurements of water level are listed. For wells equipped with recorders, abbreviated tables are published; generally, only water-level lows are listed for every fifth day and at the end of the month (eom). The highest and lowest water levels of the water year and their dates of occurrence are shown on a line below the abbreviated table. Because all values are not published for wells with recorders, the extremes may be values that are not listed in the table. Missing records are indicated by dashes in place of the water level.

RECORDS OF GROUND-WATER QUALITY

Records of ground-water quality in this report differ from other types of records in that for most sampling sites they consist of only one set of measurements for the water year. The quality of ground water ordinarily changes only slowly; therefore, for most general purposes one annual sampling, or only a few samples taken at infrequent intervals during the year, is sufficient. Frequent measurement of the same constituents is not necessary unless one is concerned with a particular problem, such as monitoring for trends in nitrate concentration. In the special cases where the quality of ground water may change more rapidly, more frequent measurements are made to identify the nature of the changes.

Data Collection and Computation

The records of ground-water quality in this report were obtained mostly as a part of special studies in specific areas. Consequently, a number of chemical analyses are presented for some counties but none are presented for others. As a result, the records for this year, by themselves, do not provide a balanced view of ground-water quality statewide. Such a view can be attained only by considering records for this year in context with similar records obtained for these and other counties in earlier years.

Most methods for collecting and analyzing water samples are described in the "U.S. Geological Survey Techniques of Water-Resources Investigation" manuals listed on a following page. The values reported in this report represent water-quality conditions at the time of sampling as much as possible, consistent with available sampling techniques and methods of analysis. All samples were obtained by trained personnel. The wells sampled were pumped long enough to assure that the water collected came directly from the aquifer and had not stood for a long time in the well casing where it would have been exposed to the atmosphere and to the material, possibly metal, comprising the casings.

Data Presentation

The records of ground-water quality are published in a section titled QUALITY OF GROUND WATER immediately following the ground-water-level records. Data for quality of ground water are listed alphabetically by County, and are identified by well number. The prime identification number for wells sampled is the 15-digit number derived from the latitude-longitude locations. No descriptive statements are given for ground-water-quality records; however, the well number, depth of well, date of sampling, and other pertinent data are given in the table containing the chemical analyses of the ground water. The REMARK codes listed for surface-water-quality records are also applicable to ground-water-quality records.

ACCESS TO WATSTORE DATA

The National WATer Data STOrage and REtrieval System (WATSTORE) was established for handling water data collected through the activities of the U.S. Geological Survey and to provide for more effective and efficient means of releasing the data to the public. The system is operated and maintained on the central computer facilities of the Survey at its National Center in Reston, Virginia.

WATSTORE can provide a variety of useful products ranging from simple data tables to complex statistical analyses. A minimal fee, plus the actual computer cost incurred in producing a desired product, is charged to the requester. Information about the availability of specific types of data, the acquisition of data or products, and user charges can be obtained locally from each of the Water Resources Division's district offices (see address given on back of the title page).

General inquires about WATSTORE may be directed to:

Chief Hydrologist
U.S. Geological Survey
437 National Center
Reston, Virginia 22092

DEFINITION OF TERMS

Terms related to streamflow, water-quality, and other hydrologic data, as used in this report, are defined below. See also table for converting inch-pound units to International System of units (SI) on the inside of back cover.

Acre-foot (AC-FT, acre-ft) is the quantity of water required to cover 1 acre to a depth of 1 foot and is equivalent to 43,560 cubic feet or about 326,000 gallons or 1,233 cubic meters.

Adenosine triphosphate (ATP) is the primary energy donor in cellular life process. Its central role in living cells makes it an excellent indicator of the presence of living material in water. A measure of ATP, therefore, provides a sensitive and rapid estimate of biomass. ATP is reported in micrograms per liter of the original water sample.

Algae are mostly aquatic single-celled, colonial, or multi-celled plants, containing chlorophyll and lacking roots, stems, and leaves.

Algal growth potential (AGP) is the maximum algal dry weight biomass that can be produced in a natural water sample under standardized laboratory conditions. The growth potential is the algal biomass present at stationary phase and is expressed as milligrams dry weight of algae produced per liter of sample.

Aquifer is a geologic formation, group of formations, or part of a formation that contains sufficient saturated permeable material to yield significant quantities of water to wells and springs.

Artesian means confined and is used to describe a well in which the water level stands above the top of the aquifer tapped by the well. A flowing artesian well is one in which the water level is above the land surface.

Bacteria are microscopic unicellular organisms, typically spherical, rodlike, or spiral and threadlike in shape, often clumped into colonies. Some bacteria cause disease, others perform an essential role in nature in the recycling of materials; for example, by decomposing organic matter into a form available for reuse by plants.

Total coliform bacteria are a particular group of bacteria that are used as indicators of possible sewage pollution. They are characterized as aerobic or facultative anaerobic, gram-negative, nonspore-forming, rod-shaped bacteria which ferment lactose with gas formation within 48 hours at 35 °C. In the laboratory these bacteria are defined as the organisms which produce colonies with a golden-green metallic sheet within 24 hours when incubated at 35 °C ± 1.0 °C on M-Endo medium (nutrient medium for bacterial growth). Their concentrations are expressed as number of colonies per 100 mL of sample.

Fecal coliform bacteria are bacteria that are present in the intestine or feces of warmblooded animals. They are often used as indicators of the sanitary quality of the water. In the laboratory they are defined as all organisms which produce blue colonies within 24 hours when incubated at 44.5 °C ± 0.2 °C on M-FC medium (nutrient medium for bacterial growth). Their concentrations are expressed as number of colonies per 100 mL of sample.

Fecal streptococcal bacteria are bacteria also found in the intestine of warmblooded animals. Their presence in water is considered to verify fecal pollution. They are characterized as gram-positive, cocci bacteria which are capable of growth in brain-heart infusion broth. In the laboratory they are defined as all the organisms which produce red or pink colonies within 48 hours at 35 °C ± 1.0 °C on M-FC medium (nutrient medium for bacterial growth). Their concentrations are expressed as number of colonies per 100 mL of sample.

Bed material is the unconsolidated material of which a streambed, lake, pond, reservoir, or estuary bottom is composed.

Biochemical oxygen demand (BOD) is a measure of the quantity of dissolved oxygen, in milligrams per liter, necessary for the decomposition of organic matter by microorganisms, such as bacteria.

Biomass is the amount of living matter present at any given time, expressed as the mass per unit area or volume of habitat.

Ash mass is the mass or amount of residue present after the residue from the dry mass determination has been ashed in a muffle furnace at a temperature of 500 °C for 1 hour. The ash mass values of zooplankton and phytoplankton are expressed in grams per cubic meter (g/m^3), and periphyton and benthic organisms in grams per square meter (g/m^2).

Dry mass refers to the weight of residue present after drying in an oven at 60 °C for zooplankton and 105 °C for periphyton, until the mass remains unchanged. This mass represents the total organic matter, ash and sediment, in the sample. Dry mass values are expressed in the same units as ash mass.

Organic mass or volatile mass of the living substance is the difference between the dry mass and the ash mass, and represents the actual mass of the living matter. The organic mass is expressed in the same units as for ash mass and dry mass.

Wet mass is the mass of living matter plus contained water.

Bottom material: See Bed Material.

Cells/volume refers to the number of cells or any organism which is counted by using a microscope and grid or counting cell. Many planktonic organisms are multicelled and are counted according to the number of contained cells per sample, usually milliliters (mL) or liters (L).

Cfs-day is the volume of water represented by a flow of 1 cubic foot per second for 24 hours. It is equivalent to 86,400 cubic feet, approximately 1.9835 acre-feet, or about 646,000 gallons or 2,447 cubic meters.

Chemical oxygen demand (COD) is a measure of the chemically oxidizable material in the water, and furnishes an approximation of the amount of organic and reducing material present. The determined value may correlate with natural water color or with carbonaceous organic pollution from sewage or industrial wastes.

Chlorophyll refers to the green pigments of plants. Chlorophyll a and b are the two most common pigments in plants.

Color unit is produced by one milligram per liter of platinum in the form of the chloroplatinate ion. Color is expressed in units of the platinum-cobalt scale.

Contents is the volume of water in a reservoir or lake. Unless otherwise indicated, volume is computed on the basis of a level pool and does not include bank storage.

Control designates a feature downstream from the gage that determines the stage-discharge relation at the gage. This feature may be a natural constriction of the channel, an artificial structure, or a uniform cross section over a long reach of the channel.

Cubic feet per second per square mile (CFSM) is the average number of cubic feet of water flowing per second from each square mile of area drained, assuming that the runoff is distributed uniformly in time and area.

Cubic foot per second (FT^3/s, ft^3/s) is the rate of discharge representing a volume of 1 cubic foot passing a given point during 1 second and is equivalent to approximately 7.48 gallons per second or 448.8 gallons per minute or 0.02832 cubic meters per second.

Discharge is the volume of water (or more broadly, volume of fluid plus suspended sediment), that passes a given point within a given period of time.

Mean discharge (MEAN) is the arithmetic mean of individual daily mean discharges during a specific period.

Instantaneous discharge is the discharge at a particular instant of time.

Dissolved refers to the amount of substance present in true chemical solution. In practice, however, the term includes all forms of substance that will pass through a 0.45-micrometer membrane filter, and thus may include some very small (colloidal) suspended particles. Analyses are performed on filtered samples.

Dissolved-solids concentration of water is determined either analytically by the "residue-on-evaporation" method, or mathematically by totaling the concentrations of individual constituents reported in a comprehensive chemical analysis. During the analytical determination of dissolved solids, the bicarbonate (generally a major dissolved component of water) is converted to carbonate. Therefore, in the mathematical calculation of dissolved-solids concentration, the bicarbonate value, in milligrams per liter, is multiplied by 0.492 to reflect the change.

Diversity index is a numerical expression of evenness of distribution of aquatic organisms. The formula for diversity index is:

$$\bar{d} = -\sum_{i=1}^{s} \frac{n_i}{n} \log_2 \frac{n_i}{n}$$

Where 'n_i' is the number of individuals per taxon, 'n' is the total number of individuals, and 's' is the total number of taxa in the sample of the community. Diversity index values range from zero, when all the organisms in the sample are the same, to some positive number, when some or all of the organisms in the sample are different.

Drainage area of a stream at a specified location is that area, measured in a horizontal plane, enclosed by a topographic divide from which direct surface runoff from precipitation normally drains by gravity into the river above the specified point. Figures of drainage area given herein include all closed basins, or noncontributing areas, within the area unless otherwise noted.

Drainage basin is a part of the surface of the earth that is occupied by a drainage system, which consists of a surface stream or a body of impounded surface water together with all tributary surface streams and bodies of impounded surface water.

Gage height (G.H.) is the water-surface elevation referred to some arbitrary gage datum. Gage height is often used interchangeably with the more general term "stage," although gage height is more appropriate when used with a reading on a gage.

Gaging station is a particular site on a stream, canal, lake, or reservoir where systematic observations of hydrologic data are obtained.

Hardness of water is a physical-chemical characteristic that is commonly recognized by the increased quantity of soap required to produce lather. It is attributable to the presence of alkaline earths (principally calcium and magnesium) and is expressed as equivalent calcium carbonate ($CaCO_3$).

Hydrologic unit is a geographic area representing part or all of a surface drainage basin or distinct hydrologic feature as delineated by the Office of Water Data Coordination on the State Hydrologic Unit Maps; each hydrologic unit is identified by an 8-digit number.

Metamorphic stage refers to the stage of development that an organism exhibits during its transformation from an immature form to an adult form. This developmental process exists for most insects, and the degree of difference from the immature stage to the adult form varies from relatively slight to pronounced, with many intermediates. Examples of metamorphic stages of insects are egg-larva-adult or egg-nymph-adult.

Methylene blue active substance (MBAS) is a measure of apparent detergents. This determination depends on the formation of a blue color when methylene blue dye reacts with synthetic detergent compounds.

Micrograms per gram (UG/G, ug/g) is a unit expressing the concentration of a chemical element as the mass (micrograms) of the element sorbed per unit mass (gram) of sediment.

Micrograms per kilogram (MG/KG, mg/kg) is a unit expressing the concentration of a chemical element as the mass (micrograms) of the element sorbed per unit mass (kilogram) of sediment.

Micrograms per liter (UG/L, ug/L) is a unit expressing the concentration of chemical constituents in solution as mass (micrograms) of solute per unit volume (liter) of water. One thousand micrograms per liter is equivalent to one milligram per liter.

Milligrams per liter (MG/L, mg/L) is a unit for expressing the concentration of chemical constituents in solution. Milligrams per liter represent the mass of solute per unit volume (liter) of water. Concentration of suspended sediment also is expressed in mg/L, and is based on the mass of sediment per liter of water-sediment mixture.

National Geodetic Vertical Datum of 1929 (NGVD) is a geodetic datum derived from a general adjustment of the first order level nets of both the United States and Canada. It was formerly called "Sea Level Datum of 1929" or "mean sea level" in this series of reports. Although the datum was derived from the average sea level over a period of many years at 26 tide stations along the Atlantic, Gulf of Mexico, and Pacific Coasts, it does not necessarily represent local mean sea level at any particular place.

National Stream Quality Accounting Network (NASQAN) is a nationwide data-collection network designed by the U.S. Geological Survey to meet many of the information needs of government agencies and other groups involved in natural or regional water-quality planning and management. The 500 or so sites in NASQAN are generally located at the downstream ends of hydrologic accounting units designated by the U.S. Geological Survey Office of Water Data Coordination in consultation with the Water Resources Council. The objectives of NASQAN are (1) to obtain information on the quality and quantity of water moving within and from the United States through a systematic and uniform process of data collection, summarization, analysis, and reporting such that the data may be used for, (2) description of the areal variability of water quality in the Nation's rivers through analysis of data from this and other programs, (3) detection of changes or trends with time in the pattern of occurrence of water-quality characteristics, and (4) providing a nationally consistent data base useful for water-quality assessment and hydrologic research.

The National Trends Network (NTN) is a 150-station network for sampling atmospheric deposition in the United States. The purpose of the network is to determine the variability, both in location and in time, of the composition of atmospheric deposition, which includes snow, rain, dust particles, aerosols, and gases. The core from which the NTN was built was the already-existing deposition-monitoring network of the National Atmospheric Deposition Program (NADP).

Organism is any living entity, such as an insect, phytoplankter, or zooplankter.

Organism count/area refers to the number of organisms collected and enumerated in a sample and adjusted to the number per area habitat, usually square meters (m^2), acres, or hectares. Periphyton, benthic organisms, and macrophytes are expressed in these terms.

Organism count/volume refers to the number of organisms collected and enumerated in a sample and adjusted to the number per sample volume, usually milliters (mL) or liters (L). Numbers of planktonic organisms can be expressed in these terms.

Total organism count is the total number of organisms collected and enumerated in any particular sample.

Parameter code numbers are unique five-digit code numbers assigned to each parameter placed into storage. These codes are assigned by the Environmental Protection Agency and are also used to identify data exchanged among agencies.

Partial record station is a particular site where limited streamflow and(or) water-quality data are collected systematically over a period of years for use in hydrologic analyses.

Particle size is the diameter, in millimeters (mm), of suspended sediment or bed material determined by either sieve or sedimentation methods. Sedimentation methods (pipet, bottom-withdrawal tube, visual-accumulation tube) determine fall diameter of particles in distilled water (chemically dispersed).

Particle-size classification used in this report agrees with recommendations made by the American Geophysical Union Subcommittee on Sediment Terminology.

The classification is as follows:

Classification	Size (mm)	Method of analysis
Clay	0.00024 - 0.004	Sedimentation.
Silt	.004 - .062	Sedimentation.
Sand	.062 - 2.0	Sedimentation or sieve.
Gravel	2.0 - 64.0	Sieve.

The particle-size distributions given in this report are not necessarily representative of all particles in transport in the stream. Most of the organic material is removed and the sample is subjected to mechanical and chemical dispersion before analysis in distilled water.

Percent composition is a unit for expressing the ratio of a particular part of a sample or population to the total sample or population, in terms of types, numbers, mass or volume.

Periphyton is the assemblage of microorganisms attached to and growing upon solid surfaces. While primarily consisting of algae, they also include bacteria, fungi, protozoa, rotifers, and other small organisms. Periphyton is a useful indicator of water quality.

Pesticides are chemical compounds used to control undesirable plants and animals. Major categories of pesticides include insecticides, miticides, fungicides, herbicides, and rodenticides. Insecticides and herbicides, which control insects and plants respectively, are the two categories reported.

Picocurie (PC, pCi) is one trillionth (1×10^{-12}) of the amount of radioactivity represented by a curie (Ci). A curie is the amount of radioactivity that yields 3.7×10^{10} radioactive disintegrations per second. A picocurie yields 2.22 dpm (disintegrations per minute).

Plankton is the community of suspended, floating, or weakly swimming organisms that live in the open water of lakes and rivers.

Phytoplankton is the plant part of the plankton. They are usually microscopic and their movement is subject to the water currents. Phytoplankton growth is dependent upon solar radiation and nutrient substances. Because they are able to incorporate as well as release materials to the surrounding water, the phytoplankton have a profound effect upon the quality of the water. They are the primary food producers in the aquatic environment, and are commonly known as algae.

Blue-green algae are a group of phytoplankton organisms having a blue pigment, in addition to the green pigment called chlorophyll. Blue-green algae often cause nuisance conditions in water.

Diatoms are the unicellular or colonial algae having a siliceous shell. Their concentrations are expressed as number of cells/mL of sample.

Green algae have chlorophyll pigments similar in color to those of higher green plants. Some forms produce algal mats or floating "moss" in lakes. Their concentrations are expressed as number of cells/mL of sample.

Zooplankton is the animal part of the plankton. Zooplankton are capable of extensive movements within the water column, and are often large enough to be seen with the unaided eye. Zooplankton are secondary consumers feeding upon bacteria, phytoplankton, and detritus. Because they are the grazers in the aquatic environment, the zooplankton are a vital part of the aquatic food web. The zooplankton community is dominated by small crustaceans and rotifers.

Polychlorinated biphenyls (PCBs) are industrial chemicals that are mixtures of chlorinated biphenyl compounds having various percentages of chlorine. They are similar in structure to organochlorine insecticides.

Primary productivity is a measure of the rate at which new organic matter is formed and accumulated through photosynthetic and chemosynthetic activity of producer organisms (chiefly green plants). The rate of primary production is estimated by measuring the amount of oxygen released (oxygen method) or the amount of carbon assimilated by the plants (carbon method).

Milligrams of carbon per area or volume per unit time [mg C/(m^2 · time) for periphyton and macrophytes and mg C/(m^3 · time) for phytoplankton] are units for expressing primary productivity. They define the amount of carbon dioxide consumed as measured by radioactive carbon (carbon 14). The carbon 14 method is of greater sensitivity than the oxygen light and dark bottle method, and is preferred for use in unenriched waters. Unit time may be either the hour or day, depending on the incubation period.

Milligrams of oxygen per area or volume per unit time [mg O_2/(m^2 · time) for periphyton and macrophytes and mg O_2/(m^3 · time) for phytoplankton] are the units for expressing primary productivity. They define production and respiration rates as estimated from changes in the measured dissolved oxygen concentration. The oxygen light and dark bottle method is preferred if the rate of primary production is sufficient for accurate measurements to be made within 24 hours. Unit time may be either the hour or day, depending on the incubation period.

Radiochemical program is a network of regularly sampled water-quality stations where samples are collected to be analyzed for radioisotypes. The streams that are sampled represent major drainage basins in the conterminous United States.

Recoverable from bottom material is the amount of a given constituent that is in solution after a representative sample of bottom material has been digested by a method (usually using an acid or mixture of acids) that results in dissolution of only readily soluble substances. Complete dissolution of all bottom material is not achieved by the digestion treatment and thus the determination represents less than the total amount (that is, less than 95 percent) of the constituent in the sample. To achieve comparability of analytical data, equivalent digestion procedures would be required of all laboratories performing such analyses because different digestion procedures are likely to produce different analytical results.

Return period is the average time interval between occurrences of a hydrological event of a given or greater magnitude, usually expressed in years. May also be called recurrence interval.

Runoff in inches (IN, in) shows the depth to which the drainage area would be covered if all the runoff for a given time period were uniformly distributed on it.

Sediment is solid material that originates mostly from disintegrated rocks and is transported by, suspended in, or deposited from water; it includes chemical and biochemical precipitates and decomposed organic material, such as humus. The quantity, characteristics, and cause of the occurrence of sediment in streams are influenced by environmental factors. Some major factors are degree of slope, length of slope, soil characteristics, land usage, and quantity and intensity of precipitation.

Bed load is the sediment that is transported in a stream by rolling, sliding, or skipping along the bed and very close to it. In this report, bed load is considered to consist of particles in transit within 0.25 ft of the streambed.

Bed load discharge (tons per day) is the quantity of bed load measured by dry weight that moves past a section as bed load in a given time.

Suspended sediment is the sediment that at any given time is maintained in suspension by the upward components of turbulent currents or that exists in suspension as a colloid.

Suspended-sediment concentration is the velocity-weighted concentration of suspended sediment in the sampled zone (from the water surface to a point approximately 0.3 ft above the bed) expressed as milligrams of dry sediment per liter of water-sediment mixture (mg/L).

Mean concentration is the time-weighted concentration of suspended sediment passing a stream section during a 24-hour day.

Suspended-sediment discharge (tons/day) is the rate at which dry weight of sediment passes a section of a stream or is the quantity of sediment, as measured by dry weight or volume, that passes a section in a given time. It is computed by multiplying discharge times mg/L times 0.0027.

Suspended-sediment load is quantity of suspended sediment passing a section in a specified period.

Total-sediment discharge (tons/day) is the sum of the suspended-sediment discharge and the bed-load discharge. It is the total quantity of sediment, as measured by dry weight or volume, that passes a section during a given time.

Total sediment load or total load is a term which refers to the total sediment (bed load plus suspended-sediment load) that is in transport. It is not synonymous with total-sediment discharge.

7-day 10 year low flow (7 Q_{10}) is the discharge at the 10-year recurrence interval taken from a frequency curve of annual values of the lowest mean discharge for 7 consecutive days (the 7-day low flow).

Sodium-adsorption--ratio (SAR) is the expression of relative activity of sodium ions in exchange reactions within soil and is an index of sodium or alkali hazard to the soil. Waters range in respect to sodium hazard from those which can be used for irrigation on almost all soils to those which are generally unsatisfactory for irrigation.

Solute is any substance derived from the atmosphere, vegetation, soil, or rocks that is dissolved in water.

Specific conductance is a measure of the ability of a water to conduct an electrical current. It is expressed in micromhos per centimeter at 25 °C. Specific conductance is related to the type and concentration of ions in solution and can be used for approximating the dissolved-solids content of the water. Commonly, the concentration of dissolved solids (in milligrams per liter) is about 65 percent of the specific conductance (in micromhos). This relation is not constant from stream to stream, and it may vary in the same source with changes in the composition of the water.

Stage-discharge relation is the relation between gage height (stage) and volume of water per unit of time, flowing in a channel.

Streamflow is the discharge that occurs in a natural channel. Although the term "discharge" can be applied to the flow of a canal, the word "streamflow" uniquely describes the discharge in a surface stream course. The term "streamflow" is more general than "runoff" as a streamflow may be applied to discharge whether or not it is affected by diversion of regulation.

Substrate is the physical surface upon which an organism lived.

Natural substrates refers to any naturally occurring emersed or submersed solid surface, such as a rock or tree, upon which an organism lived.

Artificial substrate is a device which is purposely placed in a stream or lake for colonization of organisms. The artificial substrate simplifies the community structure by standardizing the substrate from which each sample is taken. Examples of artificial substrates are basket samplers (made of wire cages filled with clean streamside rocks) and miltiplate samplers (made of hardboard) for benthic organism collection, and plexiglass strips for periphyton collection.

Surface area of a lake is that area outlined on the latest USGS topographic map as the boundary of the lake and measured by a planimeter in acres. In localities not covered by topographic maps, the areas are computed from the best maps available at the time planimetered. All areas shown are those for the stage when the planimetered map was made. All areas shown are those for the stage when the planimetered map was made.

Surficial bed material is that part (0.1 to 0.2 ft) of the bed material that is sampled using U.S. Series Bed-Material Samplers.

Suspended (as used in tables of chemical analyses) refers to the amount (concentration) of the total concentration in a water-sediment mixture. The water-sediment mixture is associated with (or sorbed on) that material retained on a 0.45 micrometer filter.

Suspended, recoverable is the amount of a given constituent that is in solution after the part of a representative water-suspended sediment sample that is retained on a 0.45 um membrane filter has been digested by a method (usually using a dilute acid solution) that results in dissolution of only readily soluble substances. Complete dissolution of all the particulate matter is not achieved by the digestion treatment and thus the determination represents something less than the "total" amount (that is, less than 95 percent) of the constituent present in the sample. To achieve comparability of analytical data, equivalent digestion procedures would be required of all laboratories performing such analyses because different digestion procedures are likely to produce different analytical results.

Determinations of "suspended, recoverable" constituents are made either by analyzing portions of the material collected on the filter or, more commonly, by difference, based on determinations of (1) dissolved and (2) total recoverable concentrations of the constituent.

Suspended, total is the total amount of a given constituent in the part of a representative water-suspended sediment sample that is retained on a 0.45 um membrane filter. This term is used only when the analytical procedure assures measurement of at least 95 percent of the constituent determined. A knowledge of the expected form of the constituent in the sample, as well as the analytical methodology used, is required to determine when the results should be reported as "suspended, total."

Determinations of "suspended, total" constituents are made either by analyzing portions of the material collected on the filter or, more commonly, by difference, based on determinations of (1) dissolved and (2) total concentrations of the constituent.

Taxonomy is the division of biology concerned with the classification and naming of organisms. The classification of organisms is based upon a hierarchical scheme beginning with Kingdom and ending with Species at the base. The higher the classification level, the fewer features the organisms have in common. For example, the taxonomy of a particular mayfly, Hexagenia limbata is the following:

Kingdom	Animal
Phylum	Arthropoda
Class	Insects
Order	Ephemeroptera
Family	Ephermeridae
Genus	Hexageria
Species	Hexagenia limbata

Thermograph is an instrument that continuously records variations of temperature on a chart. The more general term "temperature recorder" is used in the table headings and refers to any instrument that records temperature whether on a chart, a tape, or any other medium.

Time-weighted average is computed by multiplying the number of days in the sampling period by the concentrations of individual constituents for the corresponding period and dividing the sum of the products by the total number of days. A time-weighted average represents the composition of water that would be contained in a vessel or reservoir that had received equal quantities of water from the stream each day for the year.

Tons per acre-foot indicates the dry mass of dissolved solids in 1 acre-foot of water. It is computed by multiplying the concentration in milligrams per liter by 0.00136.

Tons per day is the quantity of substance in solution or suspension that passes a stream section during a 24-hour day.

Total is the total amount of a given constituent in a representative water-suspended sediment sample, regardless of the constituent's physical or chemical form. This term is used only when the analytical procedure assures measurement of at least 95 percent of the constituent present in both the dissolved and suspended phases of the sample. A knowledge of the expected form of the constituent in the sample, as well as the analytical methodology used, is required to judge when the results should be reported as "total." (Note that the word "total" does double duty here, indicating both that the sample consists of a water-suspended sediment mixture and that the analytical method determines all of the constituent in the sample.)

Total in bottom material is the total amount of a given constituent in a representative sample of bottom material. This term is used only when the analytical procedure assures measurement of at least 95 percent of the constituent determined. A knowledge of the expected form of the constituent in the sample, as well as the analytical methodology used, is required to judge when the results should be reported as "total in bottom material."

Total load (tons) is the total quantity of any individual constituent, as measured by dry mass or volume, that is dissolved in a specific amount of water (discharge) during a given time. It is computed by multiplying the total discharge, times the mg/L of the constituent, times the factor 0.0027, times the number of days.

Total recoverable refers to the amount of a given constituent that is in solution after a representative water-suspended sediment sample has been digested by a method (usually using a dilute acid solution) that results in dissolution of only readily soluble substances. Complete dissolution of all particulate matter is not achieved by the digestion treatment, and thus the determination represents something less than the "total" amount (that is, less than 95 percent) of the constituent percent in the dissolved and suspended phases of the sample. To achieve comparability of analytical data, equivalent digestion procedures would be required of all laboratories performing such analyses because different digestion procedures are likely to produce different analytical results.

Tritium Network is a network of stations which has been established to provide baseline information on the occurrence of tritium in the Nation's surface waters. In addition to the surface-water stations in the network, tritium data are also obtained at a number of precipitation stations. The purpose of the precipitation stations is to provide an estimate sufficient for hydrologic studies of the tritium input to the United States.

Water year in Geological Survey reports dealing with surface-water supply is the 12-month period, October 1 through September 30. The water year is designated by the calendar year in which it ends and which includes 9 of the 12 months. Thus, the year ending September 30, 1980, is called the "1980 water year."

WDR is used as an abbreviation for "Water-Data Report" in reference to published reports beginning in 1975.

Weighted average is used in this report to indicate discharge-weighted average. It is computed by multiplying the discharge for a sampling period by the concentrations of individual constituents for the corresponding period and dividing the sum of the products by the sum of the discharges. A discharge-weighted average approximates the composition of water that would be found in a reservoir containing all the water passing a given location during the water year after thorough mixing in the reservoir.

WRD is used as an abbreviation for "Water-Resources Data" in the REVISED RECORDS paragraph to refer to State annual basic-data reports published before 1975.

WSP is used as an abbreviation for "Water-Supply Paper" in references to previously published reports.

PUBLICATIONS ON TECHNIQUES OF WATER-RESOURCES INVESTIGATIONS

The U.S. Geological Survey publishes a series of manuals describing procedures for planning and conducting specialized work in water-resources investigations. The material is grouped under major subject headings called books and is further divided into sections and chapters. For example, Section A of Book 3 (Applications of Hydraulics) pertains to surface water. The chapter, the unit of publication, is limited to a narrow field of subject matter. This format permits flexibility in revision and publication as the need arises.

The reports listed below are for sale by the U.S. Geological Survey, Books and Open- File Reports Section, Federal Center, Box 25425, Denver, Colorado 80225 (authorized agent of the Superintendent of Documents, Government Printing Office). Prepayment is required. Remittance should be sent by check or money order payable to the U.S. Geological Survey. Prices are not included because they are subject to change. Current prices can be obtained by writing to the above address. When ordering or inquiring about prices for any of these publications, please give the title, book number, chapter number, and "U.S. Geological Survey Techniques of Water-Resources Investigations."

1-D1. *Water temperature--influential factors, field measurement, and data presentation,* by H. H. Stevens, Jr., J. F. Ficke, and G. F. Smoot: USGS--TWRI Book 1, Chapter D1. 1975. 65 pages.

1-D2. *Guidelines for collection and field analysis of ground-water samples for selected unstable constituents,* by W. W. Wood: USGS--TWRI Book 1, Chapter D2. 1976. 24 pages.

2-D1. *Application of surface geophysics to ground-water investigations,* by A. A. R. Zohdy, G. P. Eaton, and D. R. Mabey: USGS--TWRI Book 2, Chapter D1. 1974. 116 pages.

2-E1. *Application of borehole geophysics to water-resources investigations,* by W. S. Keys and L. M. MacCary: USGS--TWRI Book 2, Chapter E1. 1971. 126 pages.

3-A1. *General field and office procedures for indirect discharge measurements,* by M. A. Benson and Tate Dalrymple: USGS--TWRI Book 3, Chapter A1. 1967. 30 pages.

3-A2. *Measurement of peak discharge by the slope-area method,* by Tate Dalrymple and M. A. Benson: USGS--TWRI Book 3, Chapter A2. 1967. 12 pages.

3-A3. *Measurement of peak discharge at culverts by indirect methods,* by G. L. Bodhaine: USGS--TWRI Book 3, Chapter A3. 1968. 60 pages.

3-A4. *Measurement of peak discharge at width contractions by indirect methods,* by H. F. Matthai: USGS--TWRI Book 3, Chapter A4. 1967. 44 Pages.

3-A5. *Measurement of peak discharge at dams by indirect methods,* by Harry Hulsing: USGS--TWRI Book 3, Chapter A5. 1967. 29 pages.

3-A6. *General procedure for gaging streams,* by R. W. Carter and Jacob Davidian: USGS--TWRI Book 3, Chapter A6. 1968. 13 pages.

3-A7. *Stage measurements at gaging stations,* by T. J. Buchanan and W. P. Somers: USGS--TWRI Book 3, Chapter A7. 1968. 28 pages.

3-A8. *Discharge measurements at gaging stations,* by T. J. Buchanan and W. P. Somers: USGS--TWRI Book 3, Chapter A8. 1969. 65 pages.

3-A9. *Measurement of time of travel and dispersion in streams by dye tracing,* by E. F. Hubbard, F. A. Kilpatrick, L. A. Martens, and J. F. Wilson, Jr.: USGS--TWRI Book 3, Chapter A9. 1982. 44 pages.

3-A10. *Discharge ratings at gaging stations,* by E. J. Kennedy: USGS--TWRI Book 3, Chapter A10. 1984. 59 pages.

3-A11. *Measurement of discharge by moving-boat method,* by G. F. Smoot and C. E. Novak: USGS--TWRI Book 3, Chapter A11. 1969. 22 pages.

3-A13. *Computation of continuous records of streamflow,* by E. J. Kennedy: USGS--TWRI Book 3, Chapter A13. 1983. 53 pages.

3-A14. *Use of flumes in measuring discharge,* by F. A. Kilpatrick and V. R. Schneider: USGS--TWRI Book 3, Chapter A14. 1983. 46 pages.

3-A15. *Computation of water-surface profiles in open channels,* by Jacob Davidian: USGS--TWRI Book 3, Chapter A15. 1984. 48 pages.

3-B1. *Aquifer-test design, observation, and data analysis,* by R. W. Stallman: USGS--TWRI Book 3, Chapter B1. 1971. 26 pages.

3-B2. *Introduction to ground-water hydraulics, a programed text for self-instruction,* by G. D. Bennett: USGS--TWRI Book 3, Chapter B2. 1976. 172 pages.

3-B3. *Type curves for selected problems of flow to wells in confined aquifers,* by J. E. Reed: USGS-TWRI Book 3, Chapter B3. 1980. 106 pages.

PUBLICATIONS ON TECHNIQUES OF WATER-RESOURCES INVESTIGATIONS--Continued

3-C1. *Fluvial sediment concepts* by H. P. Guy: USGS--TWRI Book 3, Chapter C1. 1970. 55 pages.

3-C2. *Field methods for measurement of fluvial sediment* by H. P. Guy and V. W. Norman: USGS--TWRI Book 3, Chapter C2. 1970. 59 pages.

3-C3. *Computation of fluvial-sediment discharge,* by George Porterfield: USGS--TWRI Book 3, Chapter C3. 1972. 66 pages.

4-A1. *Some statistical tools in hydrology,* by H. C. Riggs: USGS--TWRI Book 4, Chapter A1. 1968. 39 pages.

4-A2. *Frequency curves* by H. C. Riggs: USGS--TWRI Book 4, Chapter A2. 1968. 15 pages.

4-B1. *Low-flow investigations.* by H. C. Riggs: USGS--TWRI Book 4, Chapter B1. 1972. 18 pages.

4-B2. *Storage analyses for water supply.* by H. C. Riggs and C. H. Hardison: USGS--TWRI Book 4, Chapter B2. 1973. 20 pages.

4-B3. *Regional analyses of streamflow characteristics* by H. C. Riggs: USGS--TWRI Book 4, Chapter B3. 1973. 15 pages.

4-D1. *Computation of rate and volume of stream depletion by wells* by C. T. Jenkins: USGS--TWRI Book 4, Chapter D1. 1970. 17 pages.

5-A1. *Methods for determination of inorganic substances in water and fluvial sediments* by M. W. Skougstad and others, editors: USGS--TWRI Book 5, Chapter A1. 1979. 626 pages.

5-A2. *Determination of minor elements in water by emission spectroscopy.* by P. R. Barnett and E. C. Mallory, Jr.: USGS--TWRI Book 5, Chapter A2. 1971. 31 pages.

5-A3. *Methods for analysis of organic substances in water.* by D. F. Goerlitz and Eugene Brown: USGS--TWRI Book 5, Chapter A3. 1972. 40 pages.

5-A4. *Methods for collection and analysis of aquatic biological and microbiological samples* edited by P. E. Greeson, T. A. Ehlke, G. A. Irwin, B. W. Lium, and K. V. Slack: USGS--TWRI Book 5, Chapter A4. 1977. 332 pages.

5-A5. *Methods for determination of radioactive substances in water and fluvial sediments.* by L. L. Thatcher, V. J. Janzer, and K. W. Edwards: USGS--TWRI Book 5, Chapter A5. 1977. 95 pages.

5-A6. *Quality assurance practices for the chemical and biological analyses of water and fluvial sedments,* by L. C. Friedman and D. E. Erdmann: USGS--TWRI Book 5, Chapter A6. 1982. 181 pages.

5-C1. *Laboratory theory and methods for sediment analysis.* by H. P. Guy: USGS--TWRI Book 5, Chapter C1. 1969. 58 pages.

7-C1. *Finite difference model for aquifer simulation in two dimensions with results of numerical experiments,* by P. C. Trescott, G. F. Pinder, and S. P. Larson: USGS--TWRI Book 7, Chapter C1. 1976. 116 pages.

7-C2. *Computer model of two-dimensional solute transport and dispersion in ground water.* by L. F. Konikow and J. D. Bredehoeft: USGS--TWRI Book 7, Chapter C2. 1978. 90 pages.

7-C3. *A model for simulation of flow in singular and interconnected channels* by R. W. Schaffrannek, R. A. Baltzer, and D. E. Goldberg: USGS--TWRI Book 7, Chapter C3. 1981. 110 pages.

8-A1. *Methods of measuring water levels in deep wells* by M. S. Garber and F. C. Koopman: USGS--TWRI Book 8, Chapter A1. 1968. 23 pages

8-A2. *Installation and service manual for U.S. Geological Survey manometers* by J. D. Craig: USGS--TWRI Book 8, Chapter A2. 1983. 57 pages.

8-B2. *Calibration and maintenance of vertical-axis type current meters.* by G. F. Smoot and C. E. Novak: USGS--TWRI Book 8, Chapter B2. 1968. 15 pages.

Mississippi River near Cass Lake

DISCONTINUED GAGING STATIONS

The following continuous-record streamflow or stage stations in Minnesota have been discontinued or converted to partial-record stations. Daily streamflow or stage records were collected and published for the period of record shown for each station.

Station number	Station name	Drainage area (mi^2)	Period of record
	Upper Mississippi River basin		
05210000	Mississippi River near Deer River, MN	a3,190	1945-50
05212700	Prairie River near Taconite, MN	a360	1967-83
*05213000	Prairie River near Grand Rapids, MN	485	1909†, 1925-49
05216800	O'Brien Creek near Pengilly, MN	-	1963-68
05216820	Initial tailings basin outflow near Keewatin, MN	2.5	1982-85
05217000	Swan River near Warba, MN	254	1954-69
05217500	Swan River near Swan River, MN	a290	1929
05218000	Mississippi River above Sandy River near Libby (above Sandy River), MN	4,560	1895-1915, 1925-29
05221000	Willow River near Palisade, MN	442	1929
05226200	Ripple (Mud) River near Wealthwood, MN	-	1937-39
05232000	Pelican Brook (Long Lake) near Pequot Lakes, MN	-	1938-42, 1943-47
05241500	Rabbit River near Crosby, MN	8.38	1945-63
05242700	Little Sand Lake outlet (Sand Lake outlet) near Dorset, MN	a74	1930-41
*05244000	Crow Wing River at Nimrod, MN	a1,010	1910-14, 1930-81
05244500	Crow Wing River at Motley, MN	a2,140	1909† 1913-17, 1930-31
05244980	Diversion from Long Prairie River near Osakis, MN	-	1939-47
05245000	Long Prairie River near Osakis, MN	-	1949-54
05245500	Long Prairie River near Motley, MN	973	1909-17, 1930-31
05246000	Crow Wing River at Pillager, MN	a3,230	1903†, 1909-13, 1925-50
*05261000	Mississippi River near Fort Ripley, MN	a11,010	1906, 1909-10, 1929
05261500	Nokasippi River near Fort Ripley, MN	210	1929
*05268000	Platte (Platt) River at Royalton, MN	338	1929-36
05269000	Mississippi River near Sauk Rapids, MN	a12,400	1903-06
05270000	Mississippi River at Sartell, MN	a12,450	1929, 1943-47†
05270500	Sauk River near St. Cloud, MN	925	1909-12, 1913, 1929, 1930, 1931, 1932, 1933, 1934-81
05273500	Clearwater River at Clearwater, MN	-	1937, 1940-42
05274500	Elk River above St. Francis River near Big Lake, MN	384	1929
05274700	St. Francis River at Santiago, MN	-	1965-70, 1980-81

"See footnotes at end of table."

DISCONTINUED GAGING STATIONS

Station number	Station name	Drainage area (mi^2)	Period of record
	Upper Mississippi River basin--Continued		
05274750	St. Francis River above Zimmerman, MN	-	1980-84
05274900	St. Francis River near Big Lake, MN	-	1965-70
05275500	Mississippi River at Elk River, MN	a14,500	1915-56
05276000	North Fork Crow River near Regal, MN	215	1943-54
05277000	Middle Fork Crow River at New London, MN	-	1939-42, 1943-47
05277500	Middle Fork Crow River (Calhoun Lake Diversion) near Spicer, MN	-	1939, 1940-46
05278400	North Fork Crow River near Rockford, MN	-	1909-10
05278500	South Fork Crow River at Cosmos, MN	221	1945-64
05278930	Buffalo River near Glencoe, MN	374	1972-80
*05279000	South Fork Crow River near Mayer, MN	a1,170	1934-79
05279500	South Fork Crow River near Rockford, MN	a1,250	1909-12
05283500	Mississippi River at Anoka, MN	a17,100	1897, 1905-13
05284500	Rum River at Onamia, MN	414	1910-12
05284750	Rum River at Spencer Brook MN	-	1960-64
05285000	Rum River at Cambridge, MN	a1,160	1909-14
05285500	Rum River at St. Francis, MN	-	1903
05286500	Rum River near Anoka, MN	1,430	1905-06, 1909
05289000	Minnetonka Lake (head of Minnehaha Creek) near Wayzata (at Excelsior), MN	-	1938-64
05289500	Minnehaha Creek at Minnetonka Mills, MN	130	1953-64
	Minnesota River basin		
05290000	Little Minnesota River near Peever, SD	447	1939-81
05292500	Minnesota River near Odessa, MN	a1,340	1909-12, 1944-63
05293500	Pomme de Terre River near Morris, MN	-	1937-39, 1940-47
05299500	Canby Creek at Canby, MN	-	1938-39, 1940-46
05300500	Ten Mile Creek near Boyd, MN	82.8	1949-51
05302000	Little Chippewa River near Lowry, MN	a54	1941
*05302500	Little Chippewa River near Starbuck, MN	111	1938-39
05303000	Chippewa River at diversion dam near Hancock, MN	-	1930-39, 1940-46
05303500	Chippewa River at Benson, MN	a1,270	1949-51
05304000	Shakopee Creek near Benson, MN	352	1949-54
05305000	Chippewa River near Watson, MN	a2,050	1910-17, 1931-36
05311500	Yellow Medicine River near Cottonwood, MN	465	1945-46
05312000	Spring Creek near Clarkfield, MN	a89	1945-46
05312500	Spring Creek near Hazel Run, MN	101	1945-48
05313000	Yellow Medicine River near Hanley Falls, MN	606	1945-47

"See footnotes at end of table."

DISCONTINUED GAGING STATIONS

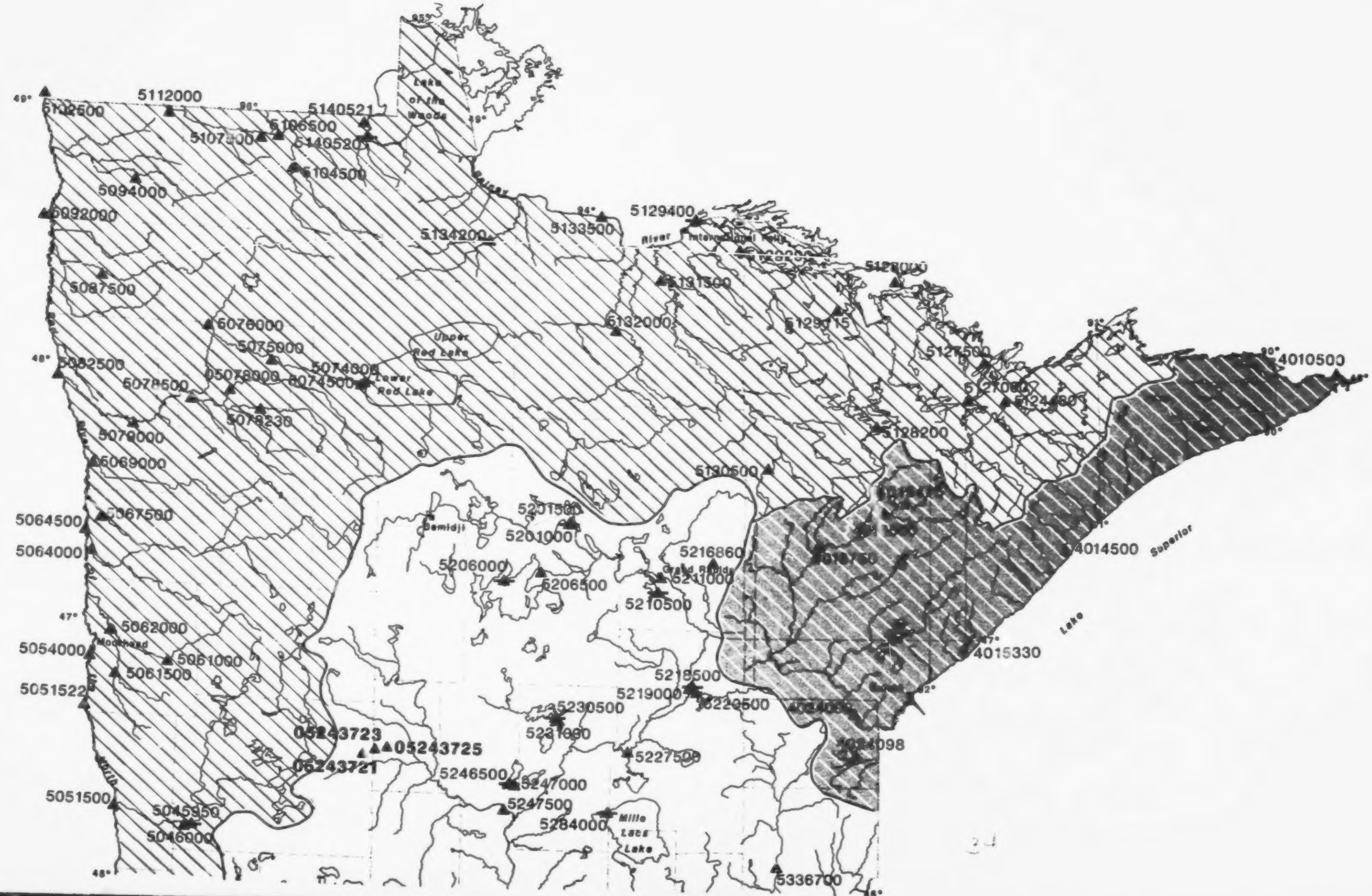
Station number	Station name	Drainage area (mi^2)	Period of record
	Minnesota River basin--Continued		
05313521	Hawk Creek at outlet of Eagle Lake near Willmar, MN	-	1972-73
05313560	Eagle Lake tributary No. 7 near Willmar, MN	-	1972-73
05313570	Eagle Lake tributary No. 8 near Willmar, MN	-	1972-73
05314000	Chetomba Creek near Maynard, MN	a200	1949-51
*05314500	Hawk Creek near Maynard, MN	474	1949-54
*05315200	Prairie Ravine near Marshall, MN	5.63	1959-64
05315500	Redwood River near Green Valley, MN	436	1945-57
05316000	Redwood River near Seaforth, MN	573	1945-46
05316770	Minnesota River at New Ulm, MN	9,536	1968-76
05316900	Dry Creek near Jeffers, MN	3.13	1982-85
05317500	Minnesota River at Judson, MN	a11,200	1938-50
*05318000	East Branch (East Fork) Blue Earth River near Bricelyn, MN	132	1951-70
05319000	South Fork Watonwan River at diversion dam near St. James, MN	-	1939, 1940-46
05321000	Blue Earth River at Mankato, MN	a3,550	1938-39, 1940-42
05330400	Sand Creek at diversion dam near Jordan, MN	-	1938-39, 1940-46
05330800	Purgatory Creek at Eden Prairie, MN	-	1975-80
05330900	Nine Mile Creek at Bloomington, MN	-	1963-73
	St. Croix River basin		
*05336200	Glaisby Brook near Kettle River, MN	24.2	1959-70
05336500	Kettle River near Sandstone, MN	825	1908-16
05337000	Grindstone River at Hinckley, MN	-	1940-47
05337500	Snake River at Mora, MN	422	1909-13
05338000	Snake River at Sanatorium Bridge near Pine City, MN	-	1937-38
*05338500	Snake River near Pine City, MN	958	1913-17, 1951-81
05339500	St. Croix River near Rush City, MN	a5,120	1923-61
05340000	Sunrise River near Stacy, MN	167	1949-65
05340050	Sunrise River near Lindstrom	231	1965-85
	Lower Mississippi River basin		
05345500	Vermillion River at Empire (Empire City), MN	124	1942-44
05346000	Vermillion River at Hastings, MN	195	1942-47
*05355200	Cannon River at Welch, MN	a1,320	1909-14, 1930-71
05371500	Mississippi River at Wabasha, MN	a56,600	1934
*05372800	South Fork Zumbro River on Belt Line at Rochester, MN	155	1981
*05372930	Bear Creek at Rochester, MN	80.0	1981
*05372950	Silver Creek at Rochester, MN	17.3	1981
*05372990	Cascade Creek at Rochester, MN	35.8	1981
05373000	South Fork Zumbro River near Rochester, MN	304	1952-81

"See footnotes at end of table."

DISCONTINUED GAGING STATIONS

Station number	Station name	Drainage area (mi^2)	Period of record
	Lower Mississippi River basin--Continued		
05373500	Zumbro River (South Branch) near Zumbro Falls, MN	821	1911-17
05374000	Zumbro River at Zumbro Falls, MN	-	1909-17, 1929-80
05374500	Zumbro River at Theilman, MN	a1,320	1938-56
*05376500	South Fork Whitewater River near Altura, MN	76.8	1939-71
05376800	Whitewater River near Beaver, MN	271	1975-85
05377000	Beaver Creek at Beaver, MN	15.4	1939-40
05377500	Whitewater River at Beaver, MN	288	1936-38 1939-56
05378230	Stockton Valley Creek at Stockton	-	1982-85
05378300	Straight Valley Creek near Rollingstone	5.16	1970-85
05379000	Gilmore Creek at Winona, MN	8.95	1939-63
05380500	Mississippi River at Lamoile, MN	a60,000	1930-31
05383500	Mississippi River at LaCrosse, WI	-	1929-55
05383600	North Branch Root River tributary near Stewartville, MN	0.73	1959-64
*05384500	Rush Creek near Rushford, MN	129	1942-79
b05385000	Root River near Houston, MN	a1,270	1909-17 1929 1930-83
b05385500	South Fork Root River near Houston, MN	275	1953-83
05386000	Root River below South Fork near Houston, MN	a1,560	1938-61
05456500	Turtle Creek near Austin, MN	144	1947-51
05475000	Heron Lake outlet near Heron Lake, MN	-	1930-43
	Big Sioux River basin		
*06483000	Rock River at Luverne, MN	440	1911-14
06603000	Little Sioux River near Lakefield, MN	17.1	1948-63
06603500	Jackson County ditch No. 11 near Lakefield, MN	7.69	1948-61

* Presently operated as a high-flow partial-record station.
† Stage records only.
a Approximately.
b Discharge measurements made to maintain a current rating.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5092000
94°
5129400
5133500
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River
International Falls
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5132000
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05078000
5074500
Lower Red Lake
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5078230
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5128200
5069000
5130500
5064500
5067500
5201500
Bemidji
5201000
5216860
4014500
Superior
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5206000
Grand Rapids
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Moorhead
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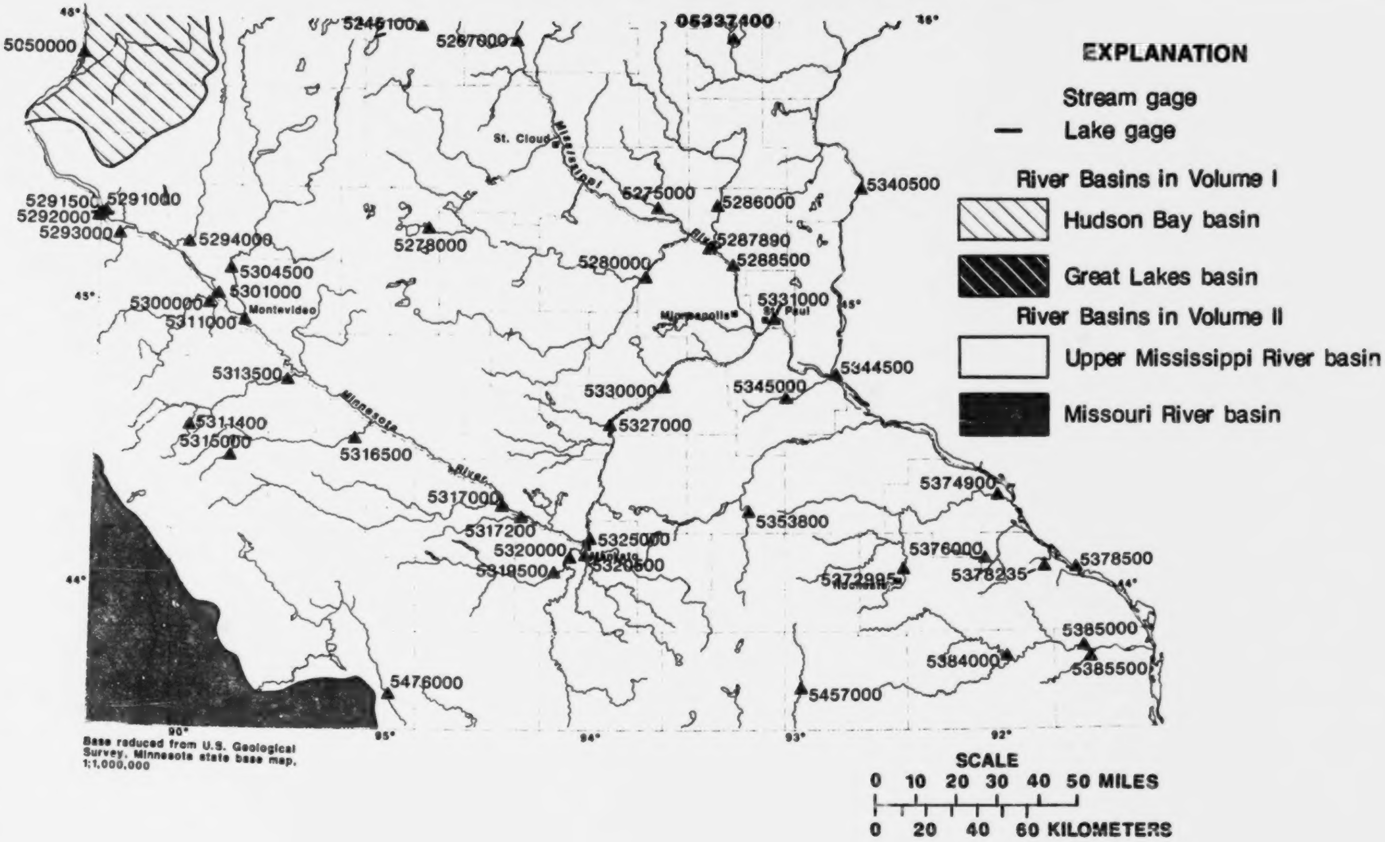
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— Lake gage
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▨ Great Lakes basin
River Basins in Volume II
☐ Upper Mississippi River basin
■ Missouri River basin
St. Cloud
Mississippi
River
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5291000
5292000
5293000
5294000
5304500
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5311000
Montevideo
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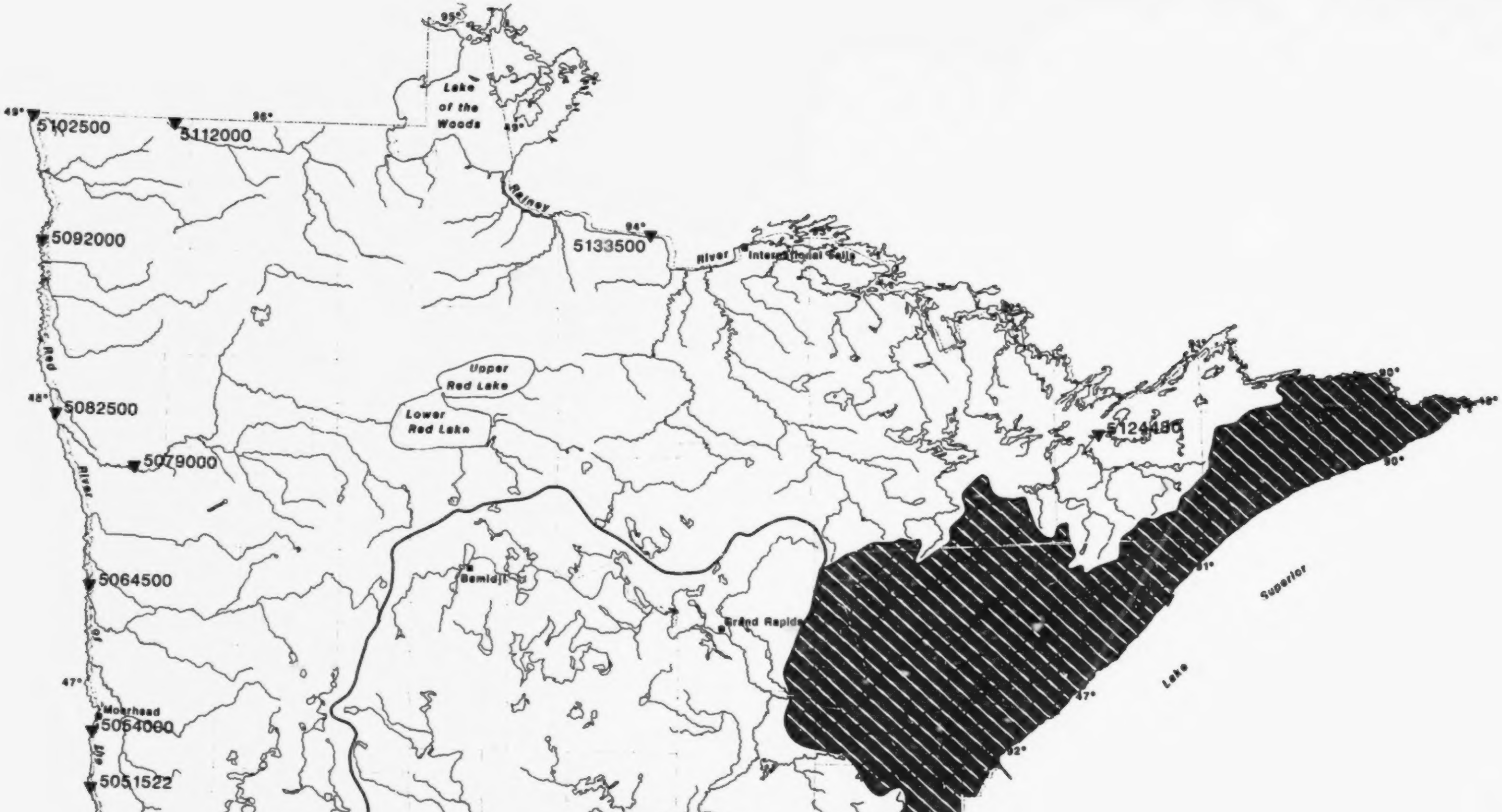
Base reduced from U.S. Geological Survey, Minnesota state base map, 1:1,000,000

Figure 8.--Location of lake and stream-gaging stations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Lower Red Lake
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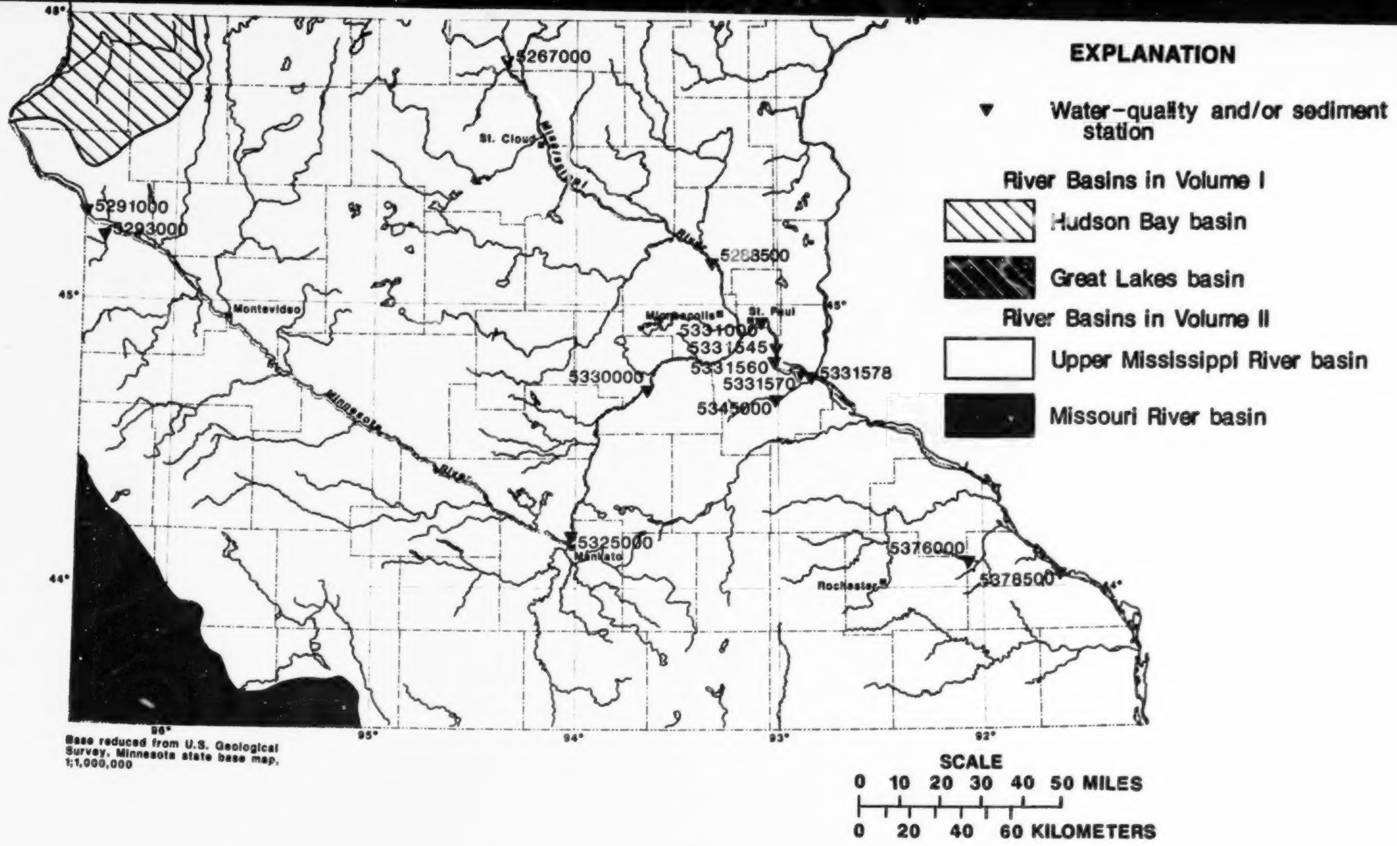
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▨ Hudson Bay basin
▨ Great Lakes basin
River Basins in Volume II
☐ Upper Mississippi River basin
■ Missouri River basin
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St. Cloud
Mississippi
River
5291000
5293000
5288500
Montevideo
Minneapolis
St. Paul
5331000
5331545
5331560
5331570
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5330000
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River
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Mankato
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Rochester
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92°
SCALE
0 10 20 30 40 50 MILES
0 20 40 60 KILOMETERS

Base reduced from U.S. Geological Survey, Minnesota state base map, 1:1,000,000

Figure 9.--Location of surface-water-quality stations

UPPER MISSISSIPPI RIVER BASIN

MISSISSIPPI RIVER MAIN STEM

05201000 WINNIBIGOSHISH LAKE NEAR DEER RIVER, MN

LOCATION.--Lat 47°25'42", long 94°03'00", in sec.25, T.146 N., R.27 W., Itasca County, Hydrologic Unit 07010101, on Leech Lake Indian Reservation, at dam on Mississippi River, 1 mi northwest of Little Winnibigoshish Lake, 14 mi northwest of town of Deer River, and at mile 1,248 upstream from Ohio River.

DRAINAGE AREA.--1,442 mi^2.

PERIOD OF RECORD.--April 1884 to current year. Prior to October 1941 monthend contents only, published in WSP 1308. Published as Winnibigoshish Reservoir near Deer River October 1941 to September 1956.

REVISED RECORDS.--WSP 1308: 1905(M).

GAGE.--Water-stage recorder. Datum of gage is National Geodetic Vertical Datum of 1929 (levels by U.S. Army Corps of Engineers). Prior to July 8, 1949, nonrecording gage at same site, and July 9, 1949, to July 10, 1973, water-stage recorder at same site and at datum of 1,288.94 ft above National Geodetic Vertical Datum of 1929.

REMARKS.--Reservoir is formed by Winnibigoshish Lake and several other natural lakes controlled by a concrete and timber dam, completed in 1884; storage began in 1884. Capacity between elevations 1,294.94 ft and 1,303.14 ft (maximum allowable range) is 668,737 acre-ft of which 439,636 acre-ft is controlled storage between elevations 1,294.94 ft and 1,300.94 ft (normal operating range). Contents shown herein are contents above elevation 1,286.00 ft. Prior to September 1978, published contents as contents above elevation 1,288.94 ft. Water is used to benefit navigation on Mississippi River below Minneapolis.

COOPERATION.--Records were provided by U.S. Army Corps of Engineers.

EXTREMES FOR PERIOD OF RECORD.--Maximum contents observed, 996,500 acre-ft, capacity table then in use, July 30, 1905, elevation, 1,303.39 ft; minimum observed, 33,680 acre-ft, below zero of capacity table then in use, Oct. 20, 1931, elevation, 1,288.25 ft.

EXTREMES FOR CURRENT YEAR.--Maximum contents, 733,930 acre-ft, June 3, elevation, 1,298.71 ft; minimum, 631,560 acre-ft, Oct. 30, elevation, 1,297.15 ft.

MONTHEND ELEVATION AND CONTENTS, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

Date	Elevation (feet)	Contents (acre-feet)	Change in contents (acre-feet)
Sept. 30	1,297.61	661,730	
Oct. 31	1,297.34	644,010	-17,720
Nov. 30	1,297.34	644,010	0
Dec. 31	1,297.30	641,390	-2,620
CAL YR 1986			4,590
Jan. 31	1,297.19	634,180	-7,210
Feb. 28	1,297.33	643,360	9,180
Mar. 31	1,297.58	659,760	16,400
Apr. 30	1,297.70	667,640	7,880
May 31	1,298.41	714,260	46,620
June 30	1,298.00	687,340	-26,920
July 31	1,298.58	725,400	38,060
Aug. 31	1,298.39	712,940	-12,460
Sept. 30	1,298.16	697,840	-15,100
WTR YR 1987			36,110

MISSISSIPPI RIVER MAIN STEM

05201500 MISSISSIPPI RIVER AT WINNIBIGOSHISH DAM NEAR DEER RIVER, MN

LOCATION.--Lat 47°25'42", long 94°03'00", in SW¼ sec.25, T.146 N., R.27 W., Itasca County, Hydrologic Unit 07010101, on Leech Lake Indian Reservation, at dam 1 mi northwest of Little Winnibigoshish Lake, 14 mi northwest of town of Deer River, and at mile 1,248 upstream from Ohio River.

DRAINAGE AREA.--1,442 mi^2.

PERIOD OF RECORD.--May 1884 to current year. Monthly discharge only for some periods, published in WSP 1308.

GAGE.--Water-stage recorder on headwater and nonrecording gage on tailwater. Datum of gage is National Geodetic Vertical Datum of 1929 (levels by U. S. Army Corps of Engineers). Prior to June 30, 1973, gages at same sites with datum at 1,289.47 ft, adjustment of 1912. Prior to July 8, 1949, nonrecording headwater gage at same site and datum in use.

REMARKS.--Daily discharge is computed on the basis of modified weir formula and corrected to conform with discharge measurements, the head being determined from readings of headwater and tailwater gages. Flow completely regulated by Winnibigoshish Lake (station 05201000).

COOPERATION.--Daily discharge computed by U. S. Army Corps of Engineers.

AVERAGE DISCHARGE (unadjusted).--103 years, 523 ft^3/s, 4.93 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum daily discharge, 4,370 ft^3/s, Aug. 6, 1905; no flow at times in several years.

EXTREMES FOR CURRENT YEAR.--Maximum daily discharge, 1,210 ft^3/s, Sept. 26-30; minimum daily, 101 ft^3/s, Apr. 8 to May 21.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1060	616	712	710	663	200	202	101	891	404	891	599
2	1060	614	712	710	638	200	202	101	893	404	890	501
3	1060	614	712	710	639	200	202	101	981	304	890	403
4	1060	615	712	710	591	200	202	101	891	203	890	404
5	1060	615	712	710	591	200	202	101	891	203	890	404
6	1060	615	712	710	591	200	202	101	890	203	888	405
7	1060	614	710	710	494	200	202	101	890	102	888	405
8	1060	615	710	710	495	201	101	101	890	102	888	405
9	1060	616	710	710	495	202	101	101	1010	102	888	405
10	1060	616	712	710	495	201	101	101	1010	102	886	406
11	1060	616	710	710	398	201	101	101	1000	102	887	406
12	1060	615	712	710	399	202	101	101	1010	102	887	504
13	1060	616	711	710	400	202	101	101	1010	102	887	504
14	1060	614	711	710	400	202	101	101	1000	102	817	504
15	1060	616	711	710	400	202	101	101	1000	102	694	601
16	1060	616	711	710	400	202	101	101	1000	102	595	601
17	1060	616	711	710	400	202	101	101	1000	102	500	697
18	1060	616	713	710	301	202	101	101	908	102	696	793
19	1060	616	713	710	301	201	101	101	814	102	696	793
20	1050	616	712	710	301	202	101	101	693	102	696	793
21	1050	616	710	710	201	202	101	101	693	102	695	793
22	1050	616	711	710	201	202	101	102	693	102	696	890
23	917	617	712	710	201	202	101	204	597	102	696	888
24	823	617	712	710	201	202	101	305	500	202	696	1010
25	825	617	712	709	201	202	101	400	403	307	695	1100
26	825	617	710	709	200	202	101	506	403	410	694	1210
27	825	711	710	709	200	202	101	606	404	506	695	1210
28	825	711	710	709	200	202	101	605	404	605	695	1210
29	825	712	710	709	---	202	101	604	404	703	695	1210
30	707	712	710	709	---	202	101	701	404	797	695	1210
31	707	---	710	663	---	202	---	797	---	891	696	---
TOTAL	30569	18853	22046	21957	10997	6244	3737	6951	23577	7876	23894	21264
MEAN	986	628	711	708	393	201	125	224	786	254	771	709
MAX	1060	712	713	710	663	202	202	797	1010	891	891	1210
MIN	707	614	710	663	200	200	101	101	403	102	500	403
AC-FT	60630	37390	43730	43550	21810	12380	7410	13790	46760	15620	47390	42180
CFSM	.68	.44	.49	.49	.27	.14	.09	.16	.55	.18	.53	.49
IN.	.79	.49	.57	.57	.28	.16	.10	.18	.61	.20	.62	.55

CAL YR 1986 TOTAL 275309 MEAN 754 MAX 1090 MIN 101 AC-FT 546100 CFSM .52 IN. 7.10
WTR YR 1987 TOTAL 197965 MEAN 542 MAX 1210 MIN 101 AC-FT 392700 CFSM .38 IN. 5.11

LEECH LAKE RIVER BASIN

465724094402601 WILLIAMS LAKE NEAR AKELEY, MN

LOCATION.--Lat 46°57'24", long 94°40'26", in SE¼NW¼ sec.12, T.140 N., R.32 W., Hubbard County, Hydrologic Unit 07010102. Samples are collected near the center of the lake at the deepest point.

DRAINAGE AREA.--0.875 mi^2 (2.27 km^2).

PERIOD OF RECORD.--Water years 1977 to current year.

REMARKS.--Additional data are available by contacting the District office.

WATER QUALITY DATA, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	TIME	SAMPLING DEPTH (M) (00098)	SPECIFIC CONDUCTANCE (US/CM) (00095)	SPECIFIC CONDUCTANCE LAB (US/CM) (90095)	PH (STANDARD UNITS) (00400)	PH LAB (STANDARD UNITS) (00403)	TEMPERATURE AIR (DEG C) (00020)	TEMPERATURE WATER (DEG C) (00010)	BAROMETRIC PRESSURE (MM OF HG) (00025)	OXYGEN, DISSOLVED (MG/L) (00300)	CALCIUM DISSOLVED (MG/L AS CA) (00915)
OCT											
20...	1205	1.0	155	168	7.9	8.5	6.5	10.5	735	9.2	21
20...	1245	9.0	153	164	7.8	8.2	6.5	10.0	735	8.5	21
20...	1400	--	--	--	--	--	6.5	--	735	--	--
NOV											
04...	1400	<1.0	155	--	8.1	--	3.0	7.0	--	12.7	--
04...	1415	1.0	154	165	8.4	8.0	3.0	7.0	--	12.3	23
04...	1420	2.0	154	--	8.6	--	3.0	7.0	--	12.1	--
04...	1430	4.0	153	--	8.7	--	3.0	7.0	--	12.0	--
04...	1440	6.0	153	--	8.7	--	3.0	7.0	--	12.0	--
04...	1455	8.0	153	166	8.8	8.0	3.0	7.0	--	12.0	24
04...	1500	--	--	--	--	--	3.0	--	--	--	--
DEC											
08...	1100	<1.0	165	--	8.2	--	-6.0	1.5	728	12.3	--
08...	1105	1.0	160	183	8.2	8.1	-6.0	3.5	728	11.3	25
08...	1115	2.0	150	--	8.2	--	-6.0	3.5	728	11.1	--
08...	1120	4.0	160	--	8.2	--	-6.0	4.0	728	10.5	--
08...	1130	6.0	164	--	7.9	--	-6.0	4.0	728	4.1	--
08...	1140	8.0	166	--	7.8	--	-6.0	4.5	728	7.4	--
08...	1145	8.7	168	180	7.7	7.9	-6.0	4.5	728	6.7	24
08...	1410	--	--	--	--	--	-6.0	--	728	--	--
JAN											
06...	1015	<1.0	170	--	8.2	--	-1.0	0.5	724	12.3	--
06...	1020	1.0	169	190	8.1	7.7	-1.0	3.0	724	11.4	26
06...	1030	2.0	165	--	8.0	--	-1.0	4.0	724	10.2	--
06...	1035	4.0	165	--	7.9	--	-1.0	4.0	724	9.3	--
06...	1040	6.0	168	--	7.8	--	-1.0	4.5	724	7.3	--
06...	1045	8.0	174	--	7.6	--	-1.0	4.5	724	5.3	--
06...	1050	8.6	180	196	7.5	7.5	-1.0	4.5	724	4.5	25
06...	1400	--	--	--	--	--	-1.0	--	724	--	--
FEB											
03...	1015	<1.0	179	--	7.6	--	-9.0	--	731	10.9	--
03...	1020	1.0	175	201	7.6	7.3	-9.0	3.0	731	9.3	27
03...	1030	2.0	176	--	7.6	--	-9.0	3.5	731	8.5	--
03...	1035	4.0	177	--	7.5	--	-9.0	4.0	731	6.9	--
03...	1045	6.0	182	--	7.5	--	-9.0	4.5	731	5.4	--
03...	1055	8.0	186	--	7.4	--	-9.0	4.5	731	4.4	--
03...	1110	10.0	189	207	7.3	7.4	-9.0	4.5	731	3.3	28
03...	1400	--	--	--	--	--	-9.0	--	731	--	--
MAR											
02...	1000	<1.0	175	--	7.9	--	-8.0	0.5	731	11.3	--
02...	1005	1.0	177	198	7.7	7.8	-8.0	3.5	731	8.3	27
02...	1015	2.0	178	--	7.4	--	-8.0	4.0	731	7.1	--
02...	1020	4.0	181	--	7.4	--	-8.0	4.0	731	6.5	--
02...	1025	6.0	184	--	7.3	--	-8.0	4.0	731	5.6	--
02...	1030	8.0	189	--	7.2	--	-8.0	4.5	731	3.0	--
02...	1035	8.5	194	203	7.2	7.5	-8.0	4.5	731	2.2	29
02...	1300	--	--	--	--	--	-8.0	--	731	--	--
APR											
13...	1015	<1.0	166	--	8.1	--	8.0	8.5	734	11.5	--
13...	1020	1.0	166	179	8.2	8.1	8.0	8.5	734	11.4	24
13...	1030	2.0	165	--	8.2	--	8.0	8.0	734	11.4	--
13...	1035	4.0	166	--	8.2	--	8.0	7.0	734	11.2	--
13...	1040	6.0	168	--	8.1	--	8.0	7.0	734	10.9	--
13...	1050	8.0	174	--	7.7	--	8.0	6.5	734	9.0	--
13...	1055	9.0	175	192	7.6	8.1	8.0	6.0	734	8.8	27
13...	1400	--	--	--	--	--	8.0	--	734	--	--
26...	1000	<1.0	177	--	8.4	--	17.0	14.0	--	11.3	--
26...	1015	1.0	176	191	8.6	8.6	17.0	13.5	--	11.1	25
26...	1020	2.0	176	--	8.6	--	17.0	13.0	--	10.6	--
26...	1030	4.0	176	--	8.7	--	17.0	12.5	--	10.5	--
26...	1035	6.0	174	--	8.7		17.0	12.0	--	10.3	--
26...	1040	8.0	177	--	8.6	--	17.0	8.5	--	9.7	--
26...	1050	9.0	177	199	8.6	7.9	17.0	8.5	--	9.7	26
26...	1100	--	--	--	--	--	17.0	--	--	--	--

LEECH LAKE RIVER BASIN

465724094402601 WILLIAMS LAKE NEAR AKELEY, MN--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	TIME	SAM-PLING DEPTH (M) (00098)	SPE-CIFIC CON-DUCT-ANCE (US/CM) (00095)	SPE-CIFIC CON-DUCT-ANCE LAB (US/CM) (90095)	PH (STAND-ARD UNITS) (00400)	PH LAB (STAND-ARD UNITS) (00403)	TEMPER-ATURE AIR (DEG C) (00020)	TEMPER-ATURE WATER (DEG C) (00010)	BARO-METRIC PRES-SURE (MM OF HG) (00025)	OXYGEN, DIS-SOLVED (MG/L) (00300)	CALCIUM DIS-SOLVED (MG/L AS CA) (00915)
MAY											
12...	1010	--	--	--	--	--	--	--	--	--	--
12...	1020	1.0	177	182	8.4	8.5	--	16.0	--	10.8	24
12...	1030	9.0	179	190	8.3	8.0	--	10.5	--	9.5	25
27...	1005	1.0	159	136	8.8	7.6	21.0	16.5	753	10.5	23
27...	1100	--	--	--	--	--	21.0	--	753	--	--
27...	1155	9.0	167	192	8.2	7.8	21.0	12.0	753	6.7	24
JUN											
14...	0905	1.0	154	169	8.6	8.6	24.5	22.5	762	9.6	21
14...	0955	9.0	163	196	8.3	7.3	24.5	15.5	762	7.7	25
14...	1100	--	154	--	8.6	--	24.5	22.5	762	9.6	--
14...	1110	--	163	--	8.3	--	24.5	15.5	762	7.7	--
29...	1005	1.0	147	160	8.7	8.9	17.0	22.5	761	9.8	19
29...	1055	9.0	151	194	8.2	7.7	15.5	20.5	761	9.0	25
29...	1100	--	--	--	--	--	17.0	--	761	--	--
JUL											
13...	0900	<1.0	147	--	8.4	--	15.5	22.5	765	8.8	--
13...	0905	1.0	147	150	8.4	8.8	15.5	22.5	765	8.8	19
13...	0920	2.0	147	--	8.4	--	15.5	22.5	765	8.6	--
13...	0930	4.0	142	--	8.4	--	15.5	23.0	765	8.6	--
13...	0940	6.0	161	--	7.9	--	15.5	20.0	765	7.7	--
13...	0955	8.0	175	185	7.3	7.7	15.5	14.5	765	0.6	25
13...	1000	--	--	--	--	--	15.5	--	765	--	--
26...	1100	<1.0	145	--	8.6	--	23.0	25.5	766	9.1	--
26...	1115	1.0	145	146	8.6	8.6	23.0	25.5	766	9.0	18
26...	1120	2.0	144	--	8.6	--	23.0	25.5	766	8.8	--
26...	1130	4.0	147	--	8.6	--	23.0	24.5	766	8.5	--
26...	1140	6.0	159	--	7.9	--	23.0	22.0	766	6.6	--
26...	1155	8.0	177	187	7.3	7.4	23.0	16.0	766	0.4	26
26...	1200	--	--	--	--	--	23.0	--	766	--	--
AUG											
10...	1000	<1.0	146	--	8.4	--	21.5	24.0	761	9.0	--
10...	1005	1.0	146	152	8.5	8.8	21.5	24.0	761	8.6	18
10...	1020	2.0	146	--	8.5	--	21.5	24.0	761	8.4	--
10...	1030	4.0	145	--	8.5	--	21.5	24.0	761	8.2	--
10...	1040	6.0	156	--	7.8	--	21.5	22.5	761	6.4	--
10...	1055	8.0	176	189	7.2	7.9	21.5	16.5	761	0.6	24
10...	1100	--	--	--	--	--	21.5	--	761	--	--
24...	1015	1.0	151	11	8.4	7.6	15.5	20.5	772	8.6	20
24...	1020	2.0	150	--	8.4	--	15.5	20.5	772	8.3	--
24...	1030	4.0	149	--	8.4	--	15.5	21.0	772	8.1	--
24...	1040	6.0	148	--	8.4	--	15.5	21.0	772	7.9	--
24...	1055	8.0	178	191	7.3	8.4	15.5	17.0	772	0.4	26
24...	1100	--	193	--	7.0	--	15.5	15.0	772	0.4	--
SEP											
04...	0900	1.0	154	--	8.0	--	17.5	19.0	759	8.6	--
04...	0915	2.0	154	161	8.2	8.3	19.5	19.5	759	8.4	20
04...	0920	4.0	154	--	8.2	--	17.5	19.5	759	8.0	--
04...	0930	6.0	153	--	8.2	--	17.5	19.5	759	7.6	--
04...	0955	8.0	156	170	7.5	7.9	17.5	19.0	759	4.1	21
04...	1000	--	--	--	--	--	17.5	--	759	--	--
14...	--	--	--	--	--	--	--	--	--	--	--
23...	1040	<1.0	144	--	7.8	--	--	--	--	--	--
23...	1045	1.0	144	167	7.8	8.9	--	--	--	--	22
23...	1055	2.0	144	--	7.8	--	--	--	--	--	--
23...	1100	4.0	145	--	7.8	--	--	--	--	--	--
23...	1110	6.0	154	--	7.5	--	--	--	--	--	--
23...	1115	8.0	155	--	7.5	--	--	--	--	--	--
23...	1125	9.0	156	166	7.6	8.2	--	--	--	--	21
23...	1445	--	--	--	--	--	--	--	--	--	--

LEECH LAKE RIVER BASIN

465724094402601 WILLIAMS LAKE NEAR AKELEY, MN--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	MAGNESIUM, DISSOLVED (MG/L AS MG) (00925)	SODIUM, DISSOLVED (MG/L AS NA) (00930)	POTASSIUM, DISSOLVED (MG/L AS K) (00935)	ALKALINITY WAT WH TOT FET FIELD MG/L AS CACO3 (00410)	ALKALINITY LAB (MG/L AS CACO3) (90410)	ALKALINITY WAT WH TOT IT FIELD MG/L AS CACO3 (00419)	BICARBONATE WATER WH IT FIELD MG/L AS HCO3 (00450)	SULFATE DISSOLVED (MG/L AS SO4) (00945)	CHLORIDE, DISSOLVED (MG/L AS CL) (00940)	SILICA, DISSOLVED (MG/L AS SIO2) (00955)	SOLIDS, RESIDUE AT 180 DEG. C DISSOLVED (MG/L) (70300)
OCT											
20...	6.6	1.3	3.6	74	84	--	--	1.6	0.50	0.10	96
20...	6.6	1.2	1.3	--	84	--	--	2.0	0.50	--	97
20...	--	--	--	--	--	--	--	--	--	--	--
NOV											
04...	--	--	--	--	--	--	--	--	--	--	--
04...	7.1	1.7	1.1	--	86	--	--	1.8	0.60	0.20	--
04...	--	--	--	--	--	--	--	--	--	--	--
04...	--	--	--	--	--	--	--	--	--	--	--
04...	--	--	--	--	--	--	--	--	--	--	--
04...	7.1	1.3	1.2	--	86	--	--	2.1	0.60	0.20	--
04...	--	--	--	--	--	--	--	--	--	--	--
DEC											
08...	--	--	--	--	--	--	--	--	--	--	--
08...	7.7	1.4	1.1	--	94	--	--	2.2	1.5	0.30	105
08...	--	--	--	--	--	--	--	--	--	--	--
08...	--	--	--	--	--	--	--	--	--	--	--
08...	--	--	--	--	--	--	--	--	--	--	--
08...	--	--	--	--	--	--	--	--	--	--	--
08...	7.4	1.3	1.1	--	92	--	--	2.7	3.2	0.60	105
08...	--	--	--	--	--	--	--	--	--	--	--
JAN											
06...	--	--	--	--	--	--	--	--	--	--	--
06...	7.8	1.4	1.1	--	99	--	--	10	0.50	0.43	100
06...	--	--	--	--	--	--	--	--	--	--	--
06 ..	--	--	--	--	--	--	--	--	--	--	--
06...	--	--	--	--	--	--	--	--	--	--	--
06...	--	--	--	--	--	--	--	--	--	--	--
06...	7.3	2.8	1.2	--	101	--	--	2.3	0.90	0.91	103
06...	--	--	--	--	--	--	--	--	--	--	--
FEB											
03...	--	--	--	--	--	--	--	--	--	--	--
03...	7.6	1.4	1.1	--	100	--	--	2.4	0.70	0.40	110
03...	--	--	--	--	--	--	--	--	--	--	--
03...	--	--	--	--	--	--	--	--	--	--	--
03...	--	--	--	--	--	--	--	--	--	--	--
03...	--	--	--	--	--	--	--	--	--	--	--
03...	7.4	1.5	1.1	--	102	--	--	2.3	0.70	0.90	105
03...	--	--	--	--	--	--	--	--	--	--	--
MAR											
02...	--	--	--	--	--	--	--	--	--	--	--
02...	7.6	1.3	1.2	--	104	--	--	1.6	0.70	0.53	103
02...	--	--	--	--	--	--	--	--	--	--	--
02...	--	--	--	--	--	--	--	--	--	--	--
02...	--	--	--	--	--	--	--	--	--	--	--
02...	--	--	--	--	--	--	--	--	--	--	--
02...	7.6	1.3	1.2	--	106	--	--	1.6	0.80	1.0	122
02...	--	--	--	--	--	--	--	--	--	--	--
APR											
13...	--	--	--	--	--	--	--	--	--	--	--
13...	6.8	1.4	1.0	--	92	--	--	1.2	0.60	0.30	107
13...	--	--	--	--	--	--	--	--	--	--	--
13...	--	--	--	--	--	--	--	--	--	--	--
13...	--	--	--	--	--	--	--	--	--	--	--
13...	--	--	--	--	--	--	--	--	--	--	--
13...	7.3	1.4	1.1	--	99	--	--	1.3	0.60	0.49	102
13...	--	--	--	--	--	--	--	--	--	--	--
26...	--	--	--	--	--	--	--	--	--	--	--
26...	7.0	1.2	1.0	--	95	--	--	1.7	0.70	0.21	--
26...	--	--	--	--	--	--	--	--	--	--	--
26...	--	--	--	--	--	--	--	--	--	--	--
26...	--	--	--	--	--	--	--	--	--	--	--
26...	--	--	--	--	--	--	--	--	--	--	--
26...	7.3	1.3	1.0	--	98	--	--	1.5	0.70	0.04	--
26...	--	--	--	--	--	--	--	--	--	--	--

LEECH LAKE RIVER BASIN

465724094402601 WILLIAMS LAKE NEAR AKELEY, MN--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	MAGNESIUM, DISSOLVED (MG/L AS MG) (00925)	SODIUM, DISSOLVED (MG/L AS NA) (00930)	POTASSIUM, DISSOLVED (MG/L AS K) (00935)	ALKALINITY WAT WH TOT FET FIELD MG/L AS CACO3 (00410)	ALKALINITY LAB (MG/L AS CACO3) (90410)	ALKALINITY WAT WH TOT IT FIELD MG/L AS CACO3 (00419)	BICARBONATE WATER WH IT FIELD MG/L AS HCO3 (00450)	SULFATE DISSOLVED (MG/L AS SO4) (00945)	CHLORIDE, DISSOLVED (MG/L AS CL) (00940)	SILICA, DISSOLVED (MG/L AS SIO2) (00955)	SOLIDS, RESIDUE AT 180 DEG. C DISSOLVED (MG/L) (70300)
MAY											
12...	--	--	--	--	--	--	--	--	--	--	--
12...	7.1	1.4	1.1	--	94	--	--	2.1	0.50	0.25	--
12...	7.1	1.4	1.0	--	96	--	--	2.2	0.50	0.72	--
27...	6.8	1.3	1.9	--	69	--	--	1.4	0.50	0.34	--
27...	--	--	--	--	--	--	--	--	--	--	--
27...	7.0	1.2	2.7	--	97	--	--	1.5	0.60	0.44	--
JUN											
14...	6.9	1.2	0.90	--	86	--	--	1.5	0.60	0.30	--
14...	7.2	1.2	1.0	--	98	--	--	1.6	0.70	0.82	--
14...	--	--	--	--	--	--	--	--	--	--	--
14...	--	--	--	--	--	--	--	--	--	--	--
29...	6.6	1.2	0.90	--	81	--	--	1.5	0.40	0.61	--
29...	7.1	1.6	1.0	--	98	--	--	1.8	0.60	1.2	--
29...	--	--	--	--	--	--	--	--	--	--	--
JUL											
13...	--	--	--	--	--	--	--	--	--	--	--
13...	7.1	1.3	1.1	--	79	--	--	1.3	0.40	0.79	--
13...	--	--	--	--	--	--	--	--	--	--	--
13...	--	--	--	--	--	--	--	--	--	--	--
13...	--	--	--	--	--	--	--	--	--	--	--
13...	7.4	1.3	1.2	--	97	--	--	1.5	0.50	0.96	--
13...	--	--	--	--	--	--	--	--	--	--	--
26...	--	--	--	--	--	--	--	--	--	--	--
26...	6.9	1.2	1.0	--	76	--	--	1.3	0.40	0.55	--
26...	--	--	--	--	--	--	--	--	--	--	--
26...	--	--	--	--	--	--	--	--	--	--	--
25...	--	--	--	--	--	--	--	--	--	--	--
26...	7.5	1.3	1.2	--	98	--	--	1.5	0.50	1.3	--
26...	--	--	--	--	--	--	--	--	--	--	--
AUG											
10...	--	--	--	--	--	--	--	--	--	--	--
10...	6.8	1.3	0.90	--	79	--	--	1.7	0.50	0.99	--
10...	--	--	--	--	--	--	--	--	--	--	--
10...	--	--	--	--	--	--	--	--	--	--	--
10...	--	--	--	--	--	--	--	--	--	--	--
10...	7.0	1.7	0.90	--	96	--	--	1.8	0.60	1.5	--
10...	--	--	--	--	--	--	--	--	--	--	--
24...	7.4	1.3	0.90	--	80	--	--	1.7	0.30	1.1	--
24...	--	--	--	--	--	--	--	--	--	--	--
24...	--	--	--	--	--	--	--	--	--	--	--
24...	--	--	--	--	--	--	--	--	--	--	--
24...	7.3	1.3	1.1	--	97	--	--	1.9	0.50	2.2	--
24...	--	--	--	--	--	--	--	--	--	--	--
SEP											
04...	--	--	--	--	--	--	--	--	--	--	--
04...	7.1	1.3	0.90	--	82	--	--	1.1	0.40	1.1	--
04...	--	--	--	--	--	--	--	--	--	--	--
04...	--	--	--	--	--	--	--	--	--	--	--
04...	7.2	1.3	1.0	--	85	--	--	1.2	4.4	1.6	--
04...	--	--	--	--	--	--	--	--	--	--	--
14...	--	--	--	--	--	--	--	--	--	--	--
23...	--	--	--	--	--	--	--	--	--	--	--
23...	7.2	1.3	2.0	75	83	75	91	2.3	0.30	1.2	94
23...	--	--	--	--	--	--	--	--	--	--	--
23...	--	--	--	--	--	--	--	--	--	--	--
23...	--	--	--	--	--	--	--	--	--	--	--
23...	7.1	1.3	1.4	--	84	--	--	1.8	0.30	1.5	93
23...	--	--	--	--	--	--	--	--	--	--	--

LEECH LAKE RIVER BASIN

465724094402601 WILLIAMS LAKE NEAR AKELEY, MN--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	NITRO-GEN, NO2+NO3 TOTAL (MG/L AS N) (00630)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N) (00631)	NITRO-GEN, AMMONIA TOTAL (MG/L AS N) (00610)	NITRO-GEN, AMMONIA DIS-SOLVED (MG/L AS N) (00608)	NITRO-GEN, AM-MONIA + ORGANIC TOTAL (MG/L AS N) (00625)	PHOS-PHOROUS TOTAL (MG/L AS P) (00665)	PHOS-PHOROUS ORTHO, DIS-SOLVED (MG/L AS P) (00671)	IRON, DIS-SOLVED (UG/L AS FE) (01046)	MANGA-NESE, DIS-SOLVED (UG/L AS MN) (01056)	CHLOR-A PHYTO-PLANK-TON CHROMO FLUOROM (UG/L) (70953)	CHLOR-B PHYTO-PLANK-TON CHROMO FLUOROM (UG/L) (70954)
OCT											
20...	--	--	--	--	--	--	--	20	2	--	--
20...	--	--	--	--	--	--	--	19	2	--	--
20...	--	--	--	--	--	0.021	--	--	--	1.90	<0.100
NOV											
04...	--	--	--	--	--	0.006	--	--	--	--	--
04...	--	--	--	--	--	--	--	36	9	--	--
04...	--	--	--	--	--	0.006	--	--	--	--	--
04...	--	--	--	--	--	0.006	--	--	--	--	--
04...	--	--	--	--	--	0.013	--	--	--	--	--
04...	--	--	--	--	--	0.009	--	33	2	--	--
04...	<0.10	0.023	<0.059	0.059	0.50	0.009	<0.009	--	--	2.60	0.200
DEC											
08...	--	--	--	--	--	0.030	--	--	--	--	--
08...	--	--	--	--	--	--	--	23	3	--	--
08...	--	--	--	--	--	0.040	--	--	--	--	--
08...	--	--	--	--	--	0.019	--	--	--	--	--
08...	--	--	--	--	--	0.010	--	--	--	--	--
08...	--	--	--	--	--	0.012	--	--	--	--	--
08...	--	--	--	--	--	--	--	47	13	--	--
08...	<0.10	0.014	--	0.095	0.90	0.007	<0.001	--	--	0.900	0.100
JAN											
06...	--	--	--	--	--	0.027	--	--	--	--	--
06...	--	--	--	--	--	--	--	61	7	--	--
06...	--	--	--	--	--	0.013	--	--	--	--	--
06...	--	--	--	--	--	0.010	--	--	--	--	--
06...	--	--	--	--	--	0.010	--	--	--	--	--
06...	--	--	--	--	--	0.053	--	--	--	--	--
06...	--	--	--	--	--	--	--	82	34	--	--
06...	<0.10	0.014	--	0.153	0.70	0.020	<0.001	--	--	2.90	<0.100
FEB											
03...	--	--	--	--	--	0.036	--	--	--	--	--
03...	--	--	--	--	--	--	--	19	<1	--	--
03...	--	--	--	--	--	0.032	--	--	--	--	--
03...	--	--	--	--	--	0.008	--	--	--	--	--
03...	--	--	--	--	--	0.014	--	--	--	--	--
03...	--	--	--	--	--	0.013	--	--	--	--	--
03...	--	--	--	--	--	--	--	67	13	--	--
03...	<0.10	0.045	--	0.240	1.1	0.019	0.002	--	--	--	--
MAR											
02...	--	--	--	--	--	0.015	--	--	--	--	--
02...	--	--	--	--	--	--	--	17	2	--	--
02...	--	--	--	--	--	0.011	--	--	--	--	--
02...	--	--	--	--	--	0.008	--	--	--	--	--
02...	--	--	--	--	--	0.008	--	--	--	--	--
02...	--	--	--	--	--	0.011	--	--	--	--	--
02...	--	--	--	--	--	--	--	52	7	--	--
02...	<0.10	0.040	--	0.169	0.60	0.013	0.001	--	--	11.0	<0.100
APR											
13...	--	--	--	--	--	0.009	--	--	--	--	--
13...	--	--	--	--	--	--	--	13	2	--	--
13...	--	--	--	--	--	0.009	--	--	--	--	--
13...	--	--	--	--	--	0.013	--	--	--	--	--
13...	--	--	--	--	--	0.014	--	--	--	--	--
13...	--	--	--	--	--	0.017	--	--	--	--	--
13...	--	--	--	--	--	--	--	21	3	--	--
13...	<0.10	0.031	--	0 024	1.4	0.025	0.006	--	--	9.90	0.200
26...	--	--	--	--	--	0.005	--	--	--	--	--
26...	--	--	--	--	--	--	--	12	<1	--	--
26...	--	--	--	--	--	0.007	--	--	--	--	--
26...	--	--	--	--	--	0.007	--	--	--	--	--
26...	--	--	--	--	--	0.010	--	--	--	--	--
26...	--	--	--	--	--	0.037	--	--	--	--	--
26...	--	--	--	--	--	--	--	23	3	--	--
26...	<0.10	0.073	0.030	0.015	1.4	0.019	0.001	--	--	15.0	0.100

LEECH LAKE RIVER BASIN

465724094402601 WILLIAMS LAKE NEAR AKELEY, MN--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	NITRO-GEN, NO2+NO3 TOTAL (MG/L AS N) (00630)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N) (00631)	NITRO-GEN, AMMONIA TOTAL (MG/L AS N) (00610)	NITRO-GEN, AMMONIA DIS-SOLVED (MG/L AS N) (00608)	NITRO-GEN, AM-MONIA + ORGANIC TOTAL (MG/L AS N) (00625)	PHOS-PHOROUS TOTAL (MG/L AS P) (00665)	PHOS-PHOROUS ORTHO, DIS-SOLVED (MG/L AS P) (00671)	IRON, DIS-SOLVED (UG/L AS FE) (01046)	MANGA-NESE, DIS-SOLVED (UG/L AS MN) (01056)	CHLOR-A PHYTO-PLANK-TON CHROMO FLUOROM (UG/L) (70953)	CHLOR-B PHYTO-PLANK-TON CHROMO FLUOROM (UG/L) (70954)
MAY											
12...	--	--	--	--	--	--	--	--	--	5.50	0.100
12...	--	--	--	--	--	--	--	11	3	--	--
12...	--	--	--	--	--	--	--	20	6	--	--
27...	--	--	--	--	--	--	--	10	2	--	--
27...	<0.10	0.033	--	0.061	1.0	0.020	0.004	--	--	1.90	0.100
27...	--	--	--	--	--	0.020	--	14	5	--	--
JUN											
14...	--	--	--	--	--	--	--	10	<1	--	--
14...	--	--	--	--	--	0.024	--	140	110	--	--
14...	--	--	--	--	--	--	--	--	--	6.40	0.300
14...	--	--	--	--	--	--	--	--	--	4.50	0.200
29...	--	--	--	--	--	--	--	27	15	--	--
29...	--	--	--	--	--	<0.008	--	57	120	--	--
29...	--	--	--	--	--	--	--	--	--	6.80	0.500
JUL											
13...	--	--	--	--	--	0.013	--	--	--	--	--
13...	--	--	--	--	--	--	--	<3	3	--	--
13...	--	--	--	--	--	0.010	--	--	--	--	--
13...	--	--	--	--	--	0.011	--	--	--	--	--
13...	--	--	--	--	--	0.015	--	--	--	--	--
13...	--	--	--	--	--	0.013	--	<3	3	--	--
13...	<0.10	0.026	--	0.052	0.70	0.013	<0.001	--	--	2.30	0.100
26...	--	--	--	--	--	0.009	--	--	--	--	--
26...	--	--	--	--	--	--	--	<3	4	--	--
26...	--	--	--	--	--	0.009	--	--	--	--	--
26...	--	--	--	--	--	0.009	--	--	--	--	--
26...	--	--	--	--	--	0.011	--	--	--	--	--
26...	--	--	--	--	--	0.017	--	5	23	--	--
26...	<0.10	<0.010	--	0.011	0.60	0.014	<0.001	--	--	3.50	0.300
AUG											
10...	--	--	--	--	--	0.008	--	--	--	--	--
10...	--	--	--	--	--	--	--	5	5	--	--
10...	--	--	--	--	--	0.008	--	--	--	--	--
10...	--	--	--	--	--	0.005	--	--	--	--	--
10...	--	--	--	--	--	0.009	--	--	--	--	--
10...	--	--	--	--	--	0.013	--	8	33	--	--
10...	<0.10	<0.010	--	<0.002	0.20	0.006	<0.001	--	--	4.20	0.300
24...	--	--	--	--	--	--	--	11	1	--	--
24...	--	--	--	--	--	0.076	--	--	--	--	--
24...	--	--	--	--	--	0.017	--	--	--	--	--
24...	--	--	--	--	--	0.018	--	--	--	--	--
24...	--	--	--	--	--	0.066	--	46	95	--	--
24...	<0.10	<0.010	<0.010	<0.002	0.60	0.012	0.003	--	--	3.40	<0.100
SEP											
04...	--	--	--	--	--	0.010	--	--	--	--	--
04...	--	--	--	--	--	--	--	13	2	--	--
04...	--	--	--	--	--	0.010	--	--	--	--	--
04...	--	--	--	--	--	0.008	--	--	--	--	--
04...	--	--	--	--	--	0.010	--	10	3	--	--
04...	<0.10	0.010	0.010	0.018	0.30	0.010	<0.001	--	--	2.50	<0.100
14...	--	--	--	--	--	0.250	--	--	--	--	--
23...	--	--	--	--	--	0.009	--	--	--	--	--
23...	--	--	--	--	--	--	--	14	2	--	--
23...	--	--	--	--	--	0.012	--	--	--	--	--
23...	--	--	--	--	--	0.013	--	--	--	--	--
23...	--	--	--	--	--	0.009	--	--	--	--	--
23...	--	--	--	--	--	0.020	--	--	--	--	--
23...	--	--	--	--	--	--	--	77	77	--	--
23...	--	--	--	--	-	--	--	--	--	7.00	0.100

LEECH LAKE RIVER BASIN

05206000 LEECH LAKE AT FEDERAL DAM, MN

LOCATION.--Lat 47°12'23", long 94°18'31", in lot 2, sec.14, T.143 N., R.29 W., Cass County, Hydrologic Unit 07010102, on Leech Lake Indian Reservation, at head of Leech Lake River on Waboose Bay, 5 mi southwest of town of Federal Dam.

DRAINAGE AREA.--1,163 mi^2.

PERIOD OF RECORD.--April 1884 to current year. Monthend contents only for some periods, published in WSP 1308. Prior to October 1956, published as "Leech Lake Reservoir."

GAGE.--Water-stage recorder. Datum of gage is National Geodetic Vertical Datum of 1929 (levels by U.S. Army Corps of Engineers). Prior to Dec. 31, 1884, nonrecording gage 0.5 mi north of outlet to Leech Lake River at datum 98.47 ft higher. Dec. 31, 1884, to May 24, 1931, nonrecording gage 0.5 mi north of outlet to Leech Lake River and May 25, 1931, to July 10, 1973, water-stage recorder at same site and at datum 92.70 ft higher.

REMARKS .--Reservoir is formed by Leech Lake and several other natural lakes controlled by concrete and timber dam; storage began in 1884; original timber structure completed in 1884, replaced by present dam in 1902. Capacity between elevation 1,292.70 ft and 1,297.94 ft (maximum allowable range) is 688,985 acre-ft of which 352,637 acre-ft is controlled storage between elevations 1,292.70 ft and 1,295.70 ft (normal operating range). Contents shown herein are contents above elevation 1,290.00 ft. Prior to September 1978, published contents as contents above elevation 1,292.20 ft. Water is used to benefit navigation on Mississippi River below Minneapolis.

COOPERATION.--Records were provided by U.S. Army Corps of Engineers.

EXTREMES FOR PERIOD OF RECORD.--Maximum contents observed, 734,300 acre-ft, capacity table then in use, June 30, 1916, elevation, 1,297.88 ft; minimum, 51,380 acre-ft, capacity table then in use, Dec. 8, 24, 1976, elevation, 1,292.69 ft.

EXTREMES FOR CURRENT YEAR.--Maximum contents, 696,350 acre-ft, Oct. 2, elevation, 1,294.80 ft; minimum, 453,890 acre-ft, Feb. 26, elevation, 1,293.63 ft.

MONTHEND ELEVATION AND CONTENTS, WATER YEAR OCTOBER 1986 to SEPTEMBER 1987

Date	Elevation (feet)	Contents (acre-feet)	Change in contents (acre-feet)
Sept. 30, 1986	1,294.84	601,410	
Oct. 31	1,294.64	576,120	-25,290
Nov. 30	1,294.38	543,240	-32,880
Dec. 31	1,294.14	512,910	-30,330
CAL YR 1986			-24,020
Jan. 31, 1987	1,293.73	464,770	-48,140
Feb. 28	1,293.64	454,980	-9,790
Mar. 31	1,293.77	469,120	14,140
Apr. 30	1,293.78	470,210	1,090
May 31	1,294.41	547,040	76,830
June 30	1,294.24	525,560	-21,480
July 31	1,294.45	552,100	26,540
Aug. 31	1,294.55	564,740	12,640
Sept. 30	1,294.68	581,170	16,430
WTR YR 1987			-20,240

LEECH LAKE RIVER BASIN

05206500 LEECH LAKE RIVER AT FEDERAL DAM, MN

LOCATION.--Lat 47°14'45", long 94°13'12", in sec.34, T.144 N., R.28 W., Cass County, Hydrologic Unit 07010102, on Leech Lake Indian Reservation, on right bank at dam on Leech Lake River at town of Federal Dam, 2 mi downstream from natural outlet of Leech Lake.

DRAINAGE AREA.--1,163 mi^2.

PERIOD OF RECORD.--May 1884 to current year. Monthly discharge only for some periods, published in WSP 1308.

GAGE.--Water-stage recorder, headwater gage, and nonrecording tailwater gage. Datum of gage is National Geodetic Vertical Datum of 1929 (levels by U. S. Army Corps of Engineers). Prior to June 30, 1973, gages (nonrecording headwater gage prior to July 3, 1948) at same sites with datum at 1,293.23 ft, adjustment of 1912. May 27 to Nov. 30, 1929, nonrecording gage at site 600 ft downstream at different datum.

REMARKS.--Discharge computed on basis of modified weir formula, the head being obtained from readings on tailwater gage and mean gage height from recording headwater gage. Flow completely regulated by Leech Lake (station 05206000).

COOPERATION.--Computations of daily discharge were provided by U.S. Army Corps of Engineers.

AVERAGE DISCHARGE (unadjusted).--103 years, 372 ft^3/s, 4.34 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum daily discharge, 2,520 ft^3/s, June 7, 1957 (result of dam failure); no flow at times.

EXTREMES FOR CURRENT YEAR.--Maximum daily discharge, 1,130 ft^3/s, Nov. 8; minimum daily, 104 ft^3/s, May 6, 7.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	583	810	981	956	893	400	408	108	336	122	138	248
2	583	792	982	952	868	400	408	108	366	128	144	287
3	572	792	1000	952	891	400	408	108	366	122	144	287
4	583	840	981	950	830	400	408	110	366	122	144	287
5	594	840	981	949	830	400	408	110	336	122	138	213
6	476	840	982	951	829	400	408	104	336	122	144	224
7	352	1030	978	953	756	400	408	104	336	122	138	224
8	216	1130	978	949	756	400	300	110	336	122	138	224
9	217	1000	978	948	756	400	300	110	336	122	138	224
10	216	1000	974	948	756	400	300	108	336	122	138	224
11	320	922	916	948	693	400	199	110	336	122	138	224
12	443	938	890	944	693	400	199	110	336	128	132	224
13	540	916	885	943	693	400	195	110	336	122	132	224
14	572	938	926	944	645	400	195	110	336	122	132	224
15	572	917	926	943	645	400	110	110	336	118	138	224
16	572	937	946	918	645	400	110	110	244	122	144	224
17	572	958	965	915	645	400	110	108	132	118	144	214
18	572	955	944	914	594	400	110	108	132	122	144	224
19	572	954	965	915	594	400	110	112	132	138	144	231
20	572	960	964	914	594	400	110	112	132	132	144	242
21	572	958	964	932	495	400	110	122	132	122	138	242
22	572	961	961	918	495	400	110	122	132	122	144	242
23	572	997	961	872	495	400	110	232	138	144	138	252
24	572	960	960	854	495	408	110	330	132	305	138	242
25	696	962	959	853	395	408	110	330	132	530	138	242
26	710	984	956	892	395	408	110	336	132	336	138	231
27	710	984	956	891	395	408	110	336	128	336	138	242
28	710	984	956	911	400	416	110	336	128	256	138	242
29	788	984	959	905	---	408	110	336	128	144	138	242
30	792	981	956	932	---	408	108	354	128	144	144	242
31	810	---	954	872	---	408	---	354	---	144	138	---
TOTAL	17203	28224	29684	28638	18171	12472	6302	5368	7212	5053	4326	7116
MEAN	555	941	958	924	649	402	210	173	240	163	140	237
MAX	810	1130	1000	956	893	416	408	354	366	530	144	287
MIN	216	792	885	853	395	400	108	104	128	118	132	213
AC-FT	34120	55980	58880	56800	36040	24740	12500	10650	14310	10020	8580	14110
CFSM	.48	.81	.82	.79	.56	.35	.18	.15	.21	.14	.12	.20
IN.	.55	.90	.95	.92	.58	.40	.20	.17	.23	.16	.14	.23

CAL YR 1986 TOTAL 244592 MEAN 670 MAX 1130 MIN 112 AC-FT 485100 CFSM .58 IN. 7.82
WTR YR 1987 TOTAL 169769 MEAN 465 MAX 1130 MIN 104 AC-FT 336700 CFSM .40 IN. 5.43

05210500 POKEGAMA LAKE NEAR GRAND RAPIDS, MN

LOCATION.--Lat 47°10'00", long 93°33'20", in NW¼ sec.17, T.54 N., R.25 W., Itasca County, Hydrologic Unit 07010101, at narrows on U.S. Highway 169, 4 mi south of Grand Rapids and at mile 1,184 upstream from Ohio River.

DRAINAGE AREA.--3,265 mi^2.

PERIOD OF RECORD.--April 1884 to current year. Prior to October 1941 monthend contents only, published in WSP 1308. Published as Pokegama Reservoir near Grand Rapids, October 1941 to September 1956.

REVISED RECORDS.--WSP 1914: 1897(M).

GAGE.--Water-stage recorder. Datum of gage is National Geodetic Vertical Datum of 1929 (levels by U.S. Army Corps of Engineers). Prior to May 30, 1949, nonrecording gage at Pooles Arm of Pokegama Lake 5 mi northwest, and May 31, 1949, to July 12, 1973, water-stage recorder at same site and at datum 64.42 ft higher.

REMARKS.--Reservoir is formed by Pokegama Lake and several other natural lakes controlled by concrete dam; storage began in 1884; original timber dam completed in 1884, replaced by present structure in 1888-89. Capacity between elevation 1,270.42 ft and 1,276.42 ft (maximum allowable range) is 80,126 acre-ft of which 52,483 acre-ft is controlled storage between elevations 1,270.42 ft and 1,274.42 ft (normal operating range). Contents shown herein are contents above elevation 1,267.00 ft. Prior to September 1978, published contents as contents above elevation 1,268.92 ft. Water is used to benefit navigation on Mississippi River below Minneapolis.

COOPERATION.--Records were provided by U.S. Army Corps of Engineers.

EXTREMES FOR PERIOD OF RECORD.--Maximum contents, 132,160 acre-ft, May 23, 1986, elevation, 1,275.28 ft; maximum elevation, 1,277.92 ft, May 8, 1897; minimum contents observed, 4,520 acre-ft, below zero of capacity table then in use, Sept. 30 [illegible]934, elevation, 1,268.54 ft.

EXTREMES FOR CURREN[illegible].--Maximum contents, 109,070 acre-ft, July 24, elevation, 1,274.09 ft; minimum, 63,890 acre-ft, Mar. 2, [illegible]ion, 1,271.06 ft.

MONTHEND ELEVATION AND CONTENTS, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

Date	Elevation (feet)	Contents (acre-feet)	Change in contents (acre-feet)
Sept. 30, 1986	1,273.24	95,160	
Oct. 31	1,272.09	78,220	-16,940
Nov. 30	1,271.88	75,230	-2,990
Dec. 31	1,271.46	69,250	-5,980
CAL YR 1986			-7,410
Jan. 31, 1987	1,271.41	68,550	-700
Feb. 28	1,271.07	64,020	-4,530
Mar. 31	1,272.19	79,640	15,620
Apr. 30	1,273.29	95,900	16,260
May 31	1,273.78	103,870	7,970
June 30	1,273.50	99,180	-4,690
July 31	1,273.50	99,180	0
Aug. 31	1,273.47	98,680	-500
Sept. 30	1,273.39	97,390	-1,290
WTR YR 1987			2,230

MISSISSIPPI RIVER MAIN STEM

05211000 MISSISSIPPI RIVER AT GRAND RAPIDS, MN

LOCATION.--Lat 47°13'56", long 93°31'48", in SW¼NW¼ sec.21, T.55 N., R.25 W., Itasca County, Hydrologic Unit 07010103, on left bank, in super-calendar room of Blandin Paper Mill in Grand Rapids, 400 ft downstream from Blandin Dam, 400 ft upstream from bridge on U.S. Highway 169, 2.5 mi upstream from Prairie River, and at mile 1,182 upstream from Ohio River.

DRAINAGE AREA.--3,370 mi^2, approximately.

PERIOD OF RECORD.--October 1883 to current year. Monthly discharge only for some periods, published in WSP 1308. Published as "at Pokegama Dam near Grand Rapids" 1942-44.

GAGE.--Water-stage recorder. Datum of gage is 1,242.03 ft above National Geodetic Vertical Datum of 1929. See WSP 1914 for history of changes prior to Jan. 17, 1951.

REMARKS.--Records fair. Flow regulated by Winnibigoshish Lake (station 05201000), Leech Lake (station 05206000), Pokegama Lake (station 05210500) and occasionally at low flow by powerplant at Blandin Dam. Backwater from Prairie River occurs at times in most years.

AVERAGE DISCHARGE.--104 years, 1,194 ft^3/s; median of yearly mean discharges, 1,080 ft^3/s.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 12,500 ft^3/s, Sept. 3, 1948, gage height, 15.2 ft, from floodmark, caused by dam failure at gage, from rating curve extended above 4,500 ft^3/s; maximum daily, 5,250 ft^3/s, Sept. 5, 8, 1905; no flow at times in several years.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 2,720 ft^3/s, Oct. 3, gage height, 7.89 ft; minimum daily, 183 ft^3/s, May 8; minimum gage height, 2.12 ft, Apr. 14.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	2490	1890	e2000	e1850	e1700	1360	1110	312	1720	643	1240	1170
2	2570	1890	e2000	e1850	e1700	1220	1050	300	1670	696	1080	1100
3	2680	1910	e2000	e1850	e1700	1060	1070	312	1670	621	1080	1100
4	2630	1890	e2000	e1900	e1700	1040	1070	316	1690	690	1070	972
5	2600	1830	e1800	e1900	e1700	987	1070	240	1640	666	1150	851
6	2540	1740	e1700	e1900	e1700	873	1060	222	1560	638	1180	705
7	2570	1780	e1700	e1900	e1700	899	1030	199	1610	621	1140	756
8	2500	1930	e1700	e1900	e1300	931	1040	183	1480	638	1160	748
9	2490	1860	e1700	e1900	e1700	931	1020	218	1290	621	1160	748
10	2460	1830	e1700	e1900	e1700	956	863	203	1360	451	1100	730
11	2410	e1800	e1700	e1900	e1700	931	651	189	1340	384	1190	823
12	2370	e1800	e1700	e1900	e1700	932	674	192	1350	392	1160	1000
13	2370	e1800	e1700	e1900	e1700	951	667	218	1300	349	1130	977
14	2340	e1800	e1700	e1900	e1700	932	541	215	1300	373	1180	915
15	2340	e1800	e1700	e1400	e1700	965	467	215	1320	380	1140	901
16	2280	e1800	e1700	e1700	e1300	941	510	212	1350	384	1130	911
17	2250	e1800	e1700	e1850	e1700	952	364	267	1350	401	1140	899
18	2230	e1800	e1750	e1850	e1700	949	238	388	1320	455	1120	1030
19	2190	e1800	e1750	e1800	e1700	940	294	610	1320	468	1330	1080
20	2170	e1800	e1750	e1800	e1650	939	273	590	1320	772	1410	1080
21	2150	e1800	e1750	e1800	e1650	950	274	678	1320	1160	1350	1140
22	2100	e1800	e1750	e1750	e1600	941	268	1100	1320	1360	1440	1250
23	2010	e1800	e1750	e1700	e1550	977	321	1380	1290	1290	1340	1590
24	2020	e1800	e1800	e1700	e1500	943	279	1660	1210	1560	1310	1780
25	2020	e1800	e1800	e1700	e1440	982	320	1570	913	e2100	1140	1930
26	2010	e1800	e1800	e1700	e1400	984	292	1680	1030	e2100	1140	2210
27	2000	e2000	e1800	e1700	e1400	1000	302	1650	991	e1800	1320	2190
28	1980	e2000	e1800	e1700	1380	1040	317	1700	997	1440	1290	1810
29	1960	e2000	e1850	e1700	---	1050	289	1750	733	1370	1200	985
30	1970	e2000	e1850	e1700	---	1070	315	1710	672	1290	1220	892
31	1970	---	e1850	e1700	---	1140	---	1710	---	1280	1200	---
TOTAL	70670	55350	55250	55700	45070	30766	18039	22289	39436	27393	37240	34273
MEAN	2280	1845	1782	1797	1610	992	601	719	1315	884	1201	1142
MAX	2680	2000	2000	1900	1700	1360	1110	1750	1720	2100	1440	2210
MIN	1960	1740	1700	1400	1300	873	238	183	672	349	1070	705
AC-FT	140200	109800	109600	110500	89400	61020	35780	44210	78220	54330	73870	67980
CFSM	.68	.55	.53	.53	.48	.29	.18	.21	.39	.26	.36	.34
IN.	.78	.61	.61	.61	.50	.34	.20	.25	.44	.30	.41	.38

CAL YR 1986 TOTAL 722645 MEAN 1980 MAX 2870 MIN 468 AC-FT 1433000 CFSM .59 IN. 7.98
WTR YR 1987 TOTAL 491476 MEAN 1347 MAX 2680 MIN 183 AC-FT 974800 CFSM .40 IN. 5.43

e Estimated

05216860 SWAN RIVER NEAR CALUMET, MN

LOCATION.--Lat 47°17'20", long 93°13'54", in NW¼SW¼ sec.35, T.56 N., R.23 W., Itasca County, Hydrologic Unit 07010103, on left bank 1.0 mi downstream from Snowball Creek, 2.1 mi downstream from bridge on U.S. Highway 65 outlet of Swan Lake and 3.1 mi southeast of Calumet.

DRAINAGE AREA.--114 mi^2.

PERIOD OF RECORD.--January 1964 to current year.

GAGE.--Water-stage recorder. Datum of gage is 1,331.19 ft above National Geodetic Vertical Datum of 1929. Prior to June 5, 1964, reference point at present site and datum.

REMARKS.--No estimated daily discharges. Records fair. Natural flow of stream affected by continually changing iron-mining activities that include diversions for iron-ore processing, storage in tailing ponds and Swan Lake, and mine pit dewatering.

AVERAGE DISCHARGE.--23 years, 66.2 ft^3/s, 7.89 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 773 ft^3/s Apr. 15, 1969, gage height, 5.83 ft; maximum gage height, 5.96 ft, Apr. 23, 1979; minimum discharge, 0.38 ft^3/s, Oct. 14, 1976, gage height, 4.16 ft.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 253 ft^3/s, May 24, gage height, 4.75 ft; minimum, 15 ft^3/s, July 16, 17, gage height, 4.05 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	77	45	51	34	32	25	100	60	169	22	132	35
2	72	46	51	33	33	25	94	58	156	23	133	34
3	71	46	50	32	33	25	88	54	139	23	126	34
4	65	45	49	32	32	24	83	48	131	22	121	34
5	59	46	48	32	32	24	79	45	126	22	115	37
6	58	55	46	32	31	25	76	44	119	22	106	37
7	56	66	48	30	31	30	73	42	110	21	101	36
8	54	72	46	32	32	34	71	37	106	20	97	38
9	51	83	44	32	30	32	74	38	97	20	92	37
10	49	91	42	32	30	34	80	38	89	18	89	40
11	48	92	42	32	30	35	82	32	83	22	80	40
12	47	87	41	32	29	35	83	31	77	21	77	40
13	46	83	40	32	30	37	83	29	74	20	75	39
14	46	79	39	32	30	37	83	28	67	19	71	38
15	44	78	39	31	29	37	81	29	64	18	69	37
16	45	75	39	30	29	36	76	32	60	17	72	36
17	44	72	39	30	27	35	77	57	56	17	67	35
18	43	68	39	30	27	34	81	92	52	47	62	39
19	44	68	38	30	26	33	84	109	51	65	60	43
20	44	68	37	30	25	33	77	129	47	79	58	44
21	44	65	36	31	25	35	79	172	43	88	56	43
22	45	65	35	31	25	35	75	224	40	106	52	41
23	50	63	35	31	25	47	74	242	36	116	49	40
24	50	62	35	31	25	62	72	250	35	132	44	39
25	51	60	34	30	25	76	73	247	31	138	44	39
26	51	59	34	30	25	91	69	239	28	144	48	42
27	51	56	33	30	25	97	67	230	27	145	46	39
28	49	56	34	30	24	101	65	218	26	144	42	39
29	49	55	34	31	---	102	63	207	23	144	38	39
30	49	53	34	32	---	100	61	197	22	143	37	38
31	44	---	34	32	---	99	---	184	---	141	36	---
TOTAL	1596	1959	1246	969	797	1475	2323	3442	2184	1979	2295	1152
MEAN	51.5	65.3	40.2	31.3	28.5	47.6	77.4	111	72.8	63.8	74.0	38.4
MAX	77	92	51	34	33	102	100	250	169	145	133	44
MIN	43	45	33	30	24	24	61	28	22	17	36	34
AC-FT	3170	3890	2470	1920	1580	2930	4610	6830	4330	3930	4550	2280
CFSM	.45	.57	.35	.27	.25	.42	.68	.97	.64	.56	.65	.34
IN.	.52	.64	.41	.32	.26	.48	.76	1.12	.71	.65	.75	.38

CAL YR 1986 TOTAL 28994 MEAN 79.4 MAX 382 MIN 19 AC-FT 57510 CFSM .70 IN. 9.46
WTR YR 1987 TOTAL 21417 MEAN 58.7 MAX 250 MIN 17 AC-FT 42480 CFSM .51 IN. 6.99

SANDY RIVER BASIN

05218500 SANDY LAKE AT LIBBY, MN

LOCATION.--Lat 46°47'20", long 93°19'10", in sec.25, T.50 N., R.24 W., Aitkin County, Hydrologic Unit 07010103, on dam on Sandy River at Libby, 1.2 mi upstream from mouth, and 14 mi north of McGregor.

DRAINAGE AREA.--421 mi^2.

PERIOD OF RECORD.--July to December 1893, October to December 1894, July 1895 to current year. Monthend contents only for some periods, published in WSP 1308. Published as Sandy Lake Reservoir at Libby, October 1941 to September 1956.

GAGE.--Water-stage recorder. Datum of gage is National Geodetic Vertical Datum of 1929 (levels by U.S. Army Corps of Engineers). Prior to Sept. 23, 1949, nonrecording gage and Sept. 24, 1949, to Nov. 28, 1962, water-stage recorder at site 1 mi upstream at datum 1,207.71 ft, adjustment of 1912. Nov. 29, 1962, to June 30, 1973, water-stage recorder at present site at datum 1,207.71 ft, adjustment of 1912.

REMARKS.--Lake is formed by concrete dam which controls Sandy, Flowage, Snake, and Aitkin Lakes. Storage began in 1893; original timber crib dam completed in 1895, replaced by present structure in 1911. Capacity between elevation 1,214.31 ft and 1,221.31 ft (top of structure) is 73,037 acre-ft, of which 37,539 acre-ft is controlled storage between elevations 1,214.31 ft and 1,218.31 ft (normal operating range). Contents shown herein are contents above elevation 1,207.00 ft. Prior to September 1978, published contents as contents above elevation 1,209.03 ft. Water is used to benefit navigation on Mississippi River below Minneapolis.

COOPERATION.--Records were provided by U.S. Army Corps of Engineers.

EXTREMES FOR PERIOD OF RECORD.--Maximum contents, 167,200 acre-ft, capacity table then in use, May 19, 1950, elevation, 1,224.82 ft; minimum observed, 5,950 acre-ft, below zero of capacity table then in use, Jan. 20, 1921, elevation, 1,207.96 ft.

EXTREMES FOR CURRENT YEAR.--Maximum contents, 70,800 acre-ft, Oct. 1, elevation, 1,217.23 ft; minimum, 44,760 acre-ft, Feb. 6, elevation, 1,214.36 ft.

MONTHEND ELEVATION AND CONTENTS, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

Date	Elevation (feet)	Contents (acre-feet)	Change in contents (acre-feet)
Sept. 30	1,217.27	71,190	
Oct. 31	1,215.60	55,410	-15,780
Nov. 30	1,215.65	55,860	450
Dec. 31	1,214.90	49,300	-6,560
CAL YR 1986			870
Jan. 31	1,214.43	45,350	-3,950
Feb. 28	1,214.42	45,260	-90
Mar. 31	1,215.46	54,160	8,900
Apr. 30	1,216.20	60,880	6,720
May 31	1,216.15	60,420	-460
June 30	1,216.17	60,610	190
July 31	1,216.46	63,340	2,730
Aug. 31	1,216.18	60,700	-2,640
Sept. 30	1,216.11	60,060	-640
WTR YR 1987			-11,130

SANDY RIVER BASIN

05219000 SANDY RIVER AT SANDY LAKE DAM, AT LIBBY, MN

LOCATION.--Lat 46°47'20", long 93°19'10", in sec.25, T.50 N., R.24 W., Aitkin County, Hydrologic Unit 07010103, at dam at outlet of Sandy Lake, at Libby, 1.2 mi above mouth, and 14 mi north of McGregor.

DRAINAGE AREA.--421 mi^2.

PERIOD OF RECORD.--July 1893 to March 1894, July 1894, November 1894 to March 1895, August 1895 to current year. Monthly discharge only for some periods, published in WSP 1308. Published as "below Sandy Lake Reservoir" 1893-1916.

GAGE.--Water-stage recorders on headwater and tailwater. Datum of gages is National Geodetic Vertical Datum of 1929 (levels by U.S. Army Corps of Engineers). Prior to June 30, 1973, gages (nonrecording gages prior to June 20, 1949) at same site with datum at 1,207.71 ft, adjustment of 1912.

REMARKS.--Discharge computed on basis of head over dam, using modified weir formula, head being obtained from headwater and tailwater recorder records. Flow completely regulated by Sandy Lake (station 05218500).

COOPERATION.--Computations of daily discharge were provided by U.S. Army Corps of Engineers; discharge measurements made and records reviewed by Geological Survey.

AVERAGE DISCHARGE (unadjusted).--92 years (water years 1896-1987), 224 ft^3/s, 7.23 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum daily discharge, 3,740 ft^3/s, July 12, 1897; no flow at times.

EXTREMES FOR CURRENT YEAR.--Maximum daily discharge, 1,350 ft^3/s, Oct 1, 2, occurred on recession following peak of Sept. 29, 1986; maximum independent daily discharge, 1,300 ft^3/s, May 25; minimum daily, 14 ft^3/s, July 29.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1350	360	413	221	113	58	77	23	1010	22	148	21
2	1350	360	413	221	113	59	77	23	416	23	154	21
3	1300	360	420	217	113	60	77	24	448	23	160	21
4	1290	365	420	217	112	62	79	24	244	23	164	21
5	1260	365	427	217	112	64	80	24	101	23	168	21
6	1220	259	235	214	112	67	80	24	106	23	174	21
7	1220	263	252	214	56	67	80	24	112	23	180	22
8	1180	259	252	214	56	67	81	24	117	23	18	22
9	1150	245	245	214	56	68	18	24	21	23	19	22
10	1150	235	235	210	58	70	19	24	21	23	20	22
11	756	245	221	210	59	72	19	24	22	23	20	22
12	812	252	214	210	58	73	19	24	23	23	20	22
13	812	249	210	207	57	73	20	24	23	24	20	22
14	812	249	210	108	56	75	20	24	23	24	20	22
15	434	242	214	110	56	76	20	24	24	24	20	21
16	455	238	221	110	57	77	20	24	24	24	20	21
17	462	228	221	115	57	77	20	24	25	24	20	21
18	462	315	224	117	58	77	21	24	25	24	21	21
19	465	305	221	113	58	77	22	118	25	23	21	21
20	469	305	224	112	57	77	22	312	20	22	21	21
21	476	305	224	112	57	76	22	570	20	21	20	21
22	483	310	224	112	57	77	23	714	21	19	20	21
23	483	310	224	110	57	77	23	924	21	18	20	21
24	483	310	228	110	57	77	23	1070	21	17	20	20
25	490	310	224	110	57	75	23	1300	21	17	20	19
26	490	310	224	112	57	74	23	1150	21	16	20	19
27	490	420	224	112	58	75	23	1100	21	16	20	19
28	490	413	224	113	58	75	23	1080	21	15	21	17
29	490	413	224	113	---	76	23	1060	21	14	21	17
30	355	413	224	113	---	78	23	1060	21	70	21	17
31	360	---	224	113	---	76	---	1010	---	72	20	---
TOTAL	23499	9213	7960	4801	1932	2232	1100	11898	3039	759	1631	619
MEAN	758	307	257	155	69.0	72.0	36.7	384	101	24.5	52.6	20.6
MAX	1350	420	427	221	113	78	81	1300	1010	72	180	22
MIN	355	228	210	108	56	58	18	23	20	14	18	17
AC-FT	46610	18270	15790	9520	3830	4430	2180	23600	6030	1510	3240	1230
CFSM	1.80	.73	.61	.37	.16	.17	.09	.91	.24	.06	.12	.05
IN.	2.08	.81	.70	.42	.17	.20	.10	1.05	.27	.07	.14	.05

CAL YR 1986 TOTAL 203084 MEAN 556 MAX 2040 MIN 51 AC-FT 402800 CFSM 1.32 IN. 17.94
WTR YR 1987 TOTAL 68683 MEAN 188 MAX 1350 MIN 14 AC-FT 136200 CFSM .45 IN. 6.07

MISSISSIPPI RIVER MAIN STEM

05220500 MISSISSIPPI RIVER BELOW SANDY RIVER, NEAR LIBBY, MN

LOCATION.--Lat 46°47'23", long 93°19'43", in SE¼NE¼ sec.25, T.50 N., R.24 W., Aitkin County, Hydrologic Unit 07010103, on right bank 600 ft downstream from Sandy River, 0.8 mi northwest of Libby, and at mile 1,106 upstream from Ohio River.

DRAINAGE AREA.--5,060 mi^2, approximately.

PERIOD OF RECORD.--April 1930 to current year.

REVISED RECORDS.--WSP 1914: 1958.

GAGE.--Water-stage recorder. Datum of gage is 1,204.06 ft above National Geodetic Vertical Datum of 1929. Prior to July 28, 1931, nonrecording gage at site 600 ft upstream at datum 3.16 ft higher.

REMARKS.--Records good except those for Nov. 12 to Apr. 1 and May 20 to June 22, which are fair. Flow regulated by Winnibigoshish Lake (station 05201000), Leech Lake (station 05206000), Pokegama Lake (station 05210500), and Sandy Lake (station 05218500).

AVERAGE DISCHARGE.--57 years, 2,100 ft^3/s, 5.64 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 16,000 ft^3/s, May 17, 1950, gage height, 20.02 ft; minimum, 83 ft^3/s, Nov. 16, 1936, gage height, 1.44 ft.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 4,790 ft^3/s, Oct. 1, stage falling, peak occurred Sept. 22, 1986; maximum independent peak discharge, 4,650 ft^3/s, May 28, based on comparisons with records for adjacent stations; minimum daily, 512 ft^3, May 13.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	4780	3050	e2600	e2350	e2050	e1700	e2250	860	e4200	1010	3240	1460
2	4780	2930	e2600	e2350	e2050	e1700	2200	863	e4000	931	3060	1440
3	4740	2890	e2600	e2350	e2000	e1700	2080	838	e3800	891	2920	1420
4	4720	2860	e2600	e2350	e2000	e1700	2010	794	e3600	885	2770	1370
5	4700	2830	e2500	e2350	e2000	e1700	2010	792	e3400	842	2580	1350
6	4670	2770	e2400	e2350	e2000	e1700	2010	786	e3200	861	2390	1210
7	4620	2830	e2400	e2300	e2000	e1800	2020	712	e3000	856	2230	1140
8	4580	3040	e2400	e2300	e2000	e1900	1940	658	e2900	856	1970	1100
9	4530	3270	e2400	e2300	e1900	e2000	1860	642	e2800	822	1840	1110
10	4310	3320	e2400	e2300	e1800	e2100	1850	599	e2700	833	1790	1120
11	4040	3130	e2400	e2300	e1900	e2200	1830	564	e2600	927	1730	1150
12	4000	e3000	e2400	e2300	e2000	e2200	1670	532	e2500	815	1730	1180
13	3970	e3000	e2400	e2300	e2000	e2200	1530	512	e2400	681	1750	1280
14	3810	e2950	e2400	e2300	e2000	e2200	1500	516	e2300	640	1720	1390
15	3620	e2900	e2400	e2220	e2000	e2200	1470	526	e2200	601	1680	1410
16	3570	e2900	e2400	e2100	e2000	e2150	1380	521	e2100	580	1660	1400
17	3540	e2850	e2400	e2000	e2000	e2150	1290	548	e2000	580	1630	1380
18	3490	e2850	e2400	e2100	e1900	e2150	1240	870	e1900	741	1590	1360
19	3450	e2800	e2400	e2200	e1950	e2150	1080	1560	e1800	1090	1570	1380
20	3390	e2800	e2400	e2200	e2000	e2200	968	e2200	e1750	1490	1590	1460
21	3340	e2800	e2400	e2150	e2000	e2300	969	e2700	e1700	1930	1740	1470
22	3300	e2750	e2400	e2150	e2000	e2400	951	e3000	e1600	2370	1780	1490
23	3270	e2750	e2400	e2100	e2000	e2500	950	e3500	1570	2710	1740	1590
24	3220	e2700	e2400	e2100	e1950	e2600	940	e4000	1570	2820	1720	1740
25	3160	e2670	e2400	e2100	e1900	e2700	939	e4300	1530	2900	1690	2040
26	3140	e2650	e2400	e2100	e1850	e2700	927	e4400	1360	3090	1610	2250
27	3130	e2600	e2400	e2100	e1800	e2700	943	e4500	1210	3310	1530	2410
28	3120	e2600	e2400	e2100	e1750	e2600	910	e4600	1210	3500	1520	2540
29	3100	e2600	e2400	e2050	---	e2500	898	e4600	1200	3600	1530	2580
30	3080	e2600	e2400	e2050	---	e2400	897	e4500	1170	3590	1520	2250
31	3070	---	e2400	e2050	---	e2300	---	e4400	---	3430	1490	---
TOTAL	118240	85690	75300	68370	54800	67500	43512	60393	69270	50182	59310	46470
MEAN	3814	2856	2429	2205	1957	2177	1450	1948	2309	1619	1913	1549
MAX	4780	3320	2600	2350	2050	2700	2250	4600	4200	3600	3240	2580
MIN	3070	2600	2400	2000	1750	1700	897	512	1170	580	1490	1100
AC-FT	234500	170000	149400	135600	108700	133900	86310	119800	137400	99540	117600	92170
CFSM	.75	.56	.48	.44	.39	.43	.29	.38	.46	.32	.38	.31
IN.	.87	.63	.55	.50	.40	.50	.32	.44	.51	.37	.44	.34

CAL YR 1986 TOTAL 1253980 MEAN 3436 MAX 7160 MIN 1900 AC-FT 2487000 CFSM .68 IN. 9.22
WTR YR 1987 TOTAL 799037 MEAN 2189 MAX 4780 MIN 512 AC-FT 1585000 CFSM .43 IN. 5.87

e Estimated

MISSISSIPPI RIVER MAIN STEM

05227500 MISSISSIPPI RIVER AT AITKIN, MN

LOCATION.--Lat 46°32'26", long 93°42'26", in SW¼NW¼ sec.24, T.47 N., R.27 W., Aitkin County, Hydrologic Unit 07010104, on right bank upstream side of highway bridge at north edge of Aitkin, 1 mi downstream from Ripple River and at mile 1,055.9 upstream from Ohio River.

DRAINAGE AREA.--6,140 mi², approximately.

PERIOD OF RECORD.--March 1945 to current year.

GAGE.--Water-stage recorder. Datum of gage is 1,182.41 ft above National Geodetic Vertical Datum of 1929 (levels by U.S. Army Corps of Engineers). Mar. 1, 1945, to Mar. 14, 1961, nonrecording gage, and Mar. 15, 1961, to Sept. 30, 1967, water-stage recorder at same site at datum 3.0 ft higher. Diversion channel: Non-recording gage. Datum of gage is 1,182.02 ft above National Geodetic Vertical Datum of 1929. Apr. 9, 1955, to Apr. 10, 1956, nonrecording gage at site 4 mi downstream at different datum. Apr. 11, 1956, to Sept. 30, 1967, non-recording gage at same site at datum 3.0 ft higher.

REMARKS.--Records good except those for Nov. 14 to Mar. 23, which are fair. Flow regulated by Winnibigoshish Lake (sta 05201000), Leech Lake (sta 05206000), Pokegama Lake (sta 05210500), and Sandy Lake (sta 05218500). Water diverted at medium and high stages into Aitkin diversion channel 6.5 mi above station, bypasses station and returns to river 15.5 mi below station. Diversion began Apr. 2, 1955. These records include flow in diversion channel.

AVERAGE DISCHARGE.--42 years, 2,963 ft³/s, 6.55 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 20,000 ft³/s, May 20, 1950, gage height, 22.49 ft, present datum; minimum, 151 ft³/s, Sept. 1, 1961, gage height, 0.60 ft.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 7,570 ft³/s, Oct. 1, stage falling, peak occurred Sept 23, 1986; maximum independent peak discharge, 6,120 ft³/s, May 29, gage height, 10.63 ft; minimum daily, 714 ft³/s, May 16. Main channel only: Maximum discharge 4,790 ft³/s, Oct. 1, stage falling, peak occurred Sept. 23, 1986; maximum independent peak discharge, 4,290 ft³/s, May 29, gage height 10.63 ft. Division channel: Maximum discharge 2,780 ft³/s, Oct. 1, stage falling, peak occurred Sept. 23, 1986, maximum independent peak discharge, 1,830 ft³/s, May 29, gage height 9.33 ft, from graph based on gage readings.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	7470	3780	e3000	e2600	e2300	e2100	2860	1230	5850	1260	3970	1610
2	7260	3720	e3000	e2600	e2300	e2000	2760	1220	5550	1190	3770	1580
3	7080	3720	e3000	e2600	e2300	e1950	2650	1190	5150	1090	3580	1540
4	6890	3630	e3000	e2600	e2300	e1900	2520	1160	4780	1020	3410	1520
5	6710	3610	e2950	e2600	e2300	e1900	2430	1120	4360	1020	3210	1490
6	6520	3570	e2950	e2550	e2300	e1900	2370	1090	4020	1020	3010	1460
7	6390	3560	e2950	e2550	e2300	e2000	2360	1060	3750	1020	2770	1360
8	6260	3760	e2900	e2550	e2300	e2200	2370	1010	3480	1030	2560	1290
9	6090	4060	e2900	e2550	e2300	e2300	2330	956	3190	1020	2330	1230
10	5940	4240	e2850	e2550	e2250	e2500	2280	919	2950	999	2160	1220
11	5700	3960	e2830	e2500	e2200	e2600	2260	895	2760	1000	2060	1230
12	5420	3640	e2800	e2500	e2100	e2600	2220	823	2600	1050	2020	1240
13	5290	3370	e2800	e2500	e2200	e2600	2130	764	2490	1020	2000	1260
14	5220	e3300	e2800	e2500	e2200	e2550	2000	734	2410	902	1990	1310
15	5090	e3250	e2800	e2500	e2200	e2550	1940	725	2280	826	1970	1410
16	4910	e3200	e2750	e2450	e2200	e2500	1900	714	2160	771	1970	1460
17	4790	e3200	e2750	e2400	e2200	e2500	1820	729	2080	733	1940	1470
18	4700	e3200	e2750	e2300	e2200	e2500	1750	864	2010	731	1910	1480
19	4630	e3200	e2750	e2300	e2110	e2500	1720	1210	1940	924	1860	1490
20	4550	e3200	e2750	e2400	e2150	e2500	1630	1860	1860	1300	1820	1510
21	4480	e3150	e2700	e2450	e2200	e2600	1500	2490	1790	1770	1810	1590
22	4410	e3150	e2700	e2450	e2200	e2700	1420	3330	1730	2220	1890	1640
23	4340	e3100	e2700	e2450	e2200	e2800	1390	4130	1690	2650	1940	1680
24	4260	e3100	e2700	e2400	e2200	3000	1360	4790	1660	2990	1910	1730
25	4190	e3100	e2700	e2400	e2200	3170	1340	5350	1630	3100	1880	1830
26	4120	e3050	e2650	e2400	e2200	3240	1340	5760	1600	3130	1840	2050
27	4090	e3050	e2650	e2350	e2150	3260	1320	5960	1490	3240	1780	2250
28	4080	e3050	e2650	e2350	e2150	3240	1300	6060	1360	3580	1700	2390
29	4020	e3000	e2650	e2350	---	3100	1270	6100	1300	3960	1660	2500
30	3990	e3000	e2650	e2350	---	3030	1240	6080	1280	4120	1660	2540
31	3920	---	e2600	e2350	---	2950	---	6000	---	4110	1630	---
TOTAL	162810	101920	86630	76400	62210	79240	57780	76323	81200	54796	70010	48360
MEAN	5252	3397	2795	2465	2222	2556	1926	2462	2707	1768	2258	1612
MAX	7470	4240	3000	2600	2300	3260	2860	6100	5850	4120	3970	2540
MIN	3920	3000	2600	2300	2100	1900	1240	714	1280	731	1630	1220
AC-FT	322900	202200	171800	151500	123400	157200	114600	151400	161100	108700	138900	95920
CFSM	.86	.55	.46	.40	.36	.42	.31	.40	.44	.29	.37	.26
IN.	.99	.62	.52	.46	.38	.48	.35	.46	.49	.33	.42	.29

CAL YR 1986 TOTAL 1670310 MEAN 4576 MAX 10700 MIN 2170 AC-FT 3313000 CFSM .75 IN. 10.12
WTR YR 1987 TOTAL 957679 MEAN 2624 MAX 7470 MIN 714 AC-FT 1900000 CFSM .43 IN. 5.80

e Estimated

PINE RIVER BASIN

05230500 PINE RIVER RESERVOIR AT CROSS LAKE, MN

LOCATION.--Lat 46°40'09", long 94°06'44", in SW¼NW¼ sec.21, T.137 N., R.27 W., Crow Wing County, Hydrologic Unit 07010105, at dam on Pine River, at outlet of Cross Lake at village of Cross Lake.

DRAINAGE AREA.--562 mi^2.

PERIOD OF RECORD.--March 1886 to current year. Monthend contents only for some periods, published in WSP 1308.

GAGE.--Water-stage recorder. Datum of gage is National Geodetic Vertical Datum of 1929 (levels by U.S. Army Corps of Engineers). Prior to May 3, 1949, nonrecording gage at same site and datum.

REMARKS.--Reservoir is formed by Trout, Whitefish, Rush, and Cross Lakes and several other natural lakes controlled by timber crib dams; storage began in 1886; dam completed in 1886. Capacity between elevations 1,226.32 ft and 1,234.82 ft (maximum allowable range) is 118,703 acre-ft of which 53,272 acre-ft is controlled storage between elevations 1,226.32 ft and 1,230.32 ft (normal operating range). Contents shown herein are contents above an elevation 1,216.00 ft. Prior to September 1978, published contents as contents above elevation 1,218.67 ft. Water is used to benefit navigation on Mississippi River below Minneapolis.

COOPERATION.--Records were provided by U.S. Army Corps of Engineers.

EXTREMES FOR PERIOD OF RECORD.--Maximum contents observed, 173,600 acre-ft, capacity table then in use, July 10, 1916, elevation, 1,234.56 ft; minimum observed, 1,310 acre-ft, below zero of capacity table then in use, Aug. 20, 1918, elevation, 1,217.67 ft.

EXTREMES FOR CURRENT YEAR.--Maximum contents, 105,020 acre-ft, May 22, elevation, 1,229.59 ft; minimum, 79,420 acre-ft, Jan. 28, elevation, 1,227.68 ft.

MONTHEND ELEVATION AND CONTENTS, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

Date	Elevation (feet)	Contents (acre-feet)	Change in contents (acre-feet)
Sept. 30, 1986	1,229.25	100,380	
Oct. 31	1,228.64	92,150	-8,230
Nov. 30	1,228.98	96,730	4,580
Dec. 31	1,227.95	82,980	-13,750
CAL YR 1986			-1,980
Jan. 31, 1987	1,227.69	79,550	-3,430
Feb. 28	1,228.05	84,300	4,750
Mar. 31	1,228.78	94,030	9,730
Apr. 30	1,229.06	97,810	3,780
May 31	1,229.28	100,790	2,980
June 30	1,229.23	100,110	-680
July 31	1,229.26	100,520	410
Aug. 31	1,229.18	99,430	-1,090
Sept. 30	1,229.20	99,700	270
WTR YR 1987			-680

PINE RIVER BASIN

05231000 PINE RIVER AT CROSS LAKE DAM, AT CROSS LAKE, MN

LOCATION.--Lat 46°40'09", long 94°06'44", in SW¼NW¼ sec.21, T.137 N., R.27 W., Crow Wing County, Hydrologic Unit 07010105, at dam at outlet of Cross Lake at Village of Cross Lake.

DRAINAGE AREA.--562 mi^2.

PERIOD OF RECORD.--April 1886 to current year. Monthly discharge only for some periods, published in WSP 1308. Published as "below Pine River Reservoir" 1895-1916, 1929, and as "at Pine River Dam, at Cross Lake" 1941-56.

GAGE.--Water-stage recorder, headwater gage, and nonrecording tailwater gage. Datum of gages is 1,216.32 ft above National Geodetic Vertical Datum of 1929 (levels by U.S. Army Corps of Engineers). Mar. 26, 1886, to May 31, 1929, nonrecording gages on headwater and tail water at same sites and datum. June 1 to Nov. 30, 1929, nonrecording gage in tailwater at datum 1.60 ft (0.49 m) lower. Dec. 1, 1929, to May 2, 1949, nonrecording gage on headwater and Dec. 1, 1929, to August 1949, nonrecording gage on tailwater at present sites and datum.

REMARKS.--Discharge computed principally on basis of modified weir formula, the head being obtained from twice-daily readings on tailwater gage and from headwater recorder. Flow completely regulated by Pine River Reservoir (station 05230500).

COOPERATION.--Computations of daily discharge were provided by U. S. Army Corps of Engineers.

AVERAGE DISCHARGE (unadjusted).--101 years, 221 ft^3/s, 5.34 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum daily discharge, 2,250 ft^3/s, in June 1896 (does not include flow bypassing dam through crevasse); no flow at times.

EXTREMES FOR CURRENT YEAR.--Maximum daily discharge, 1,000 ft^3/s, Oct. 15-17, May 26-31; minimum daily, 30 ft^3/s, Nov. 7-10, Apr. 23-30, May 1-15, June 19-30, July 1-19, 24, 28-31, Aug. 1-31, Sept. 1-18.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	570	83	450	450	250	35	249	30	775	30	30	30
2	570	70	450	450	250	35	290	30	700	30	30	30
3	570	70	450	450	250	35	290	30	700	30	30	30
4	512	70	450	450	225	35	290	30	700	30	30	30
5	470	70	450	450	200	35	290	30	466	30	30	30
6	470	48	450	450	200	35	290	30	330	30	30	30
7	470	30	450	450	168	35	290	30	250	30	30	30
8	470	30	450	450	140	35	290	30	250	30	30	30
9	370	30	450	450	140	35	290	30	250	30	30	30
10	435	30	544	450	140	35	290	30	250	30	30	30
11	631	70	600	450	140	35	168	30	160	30	30	30
12	700	140	600	450	140	35	150	30	70	30	30	30
13	700	140	600	450	140	35	150	30	70	30	30	30
14	700	140	600	400	140	152	150	30	70	30	30	30
15	1000	140	600	350	140	200	109	30	70	30	30	30
16	1000	140	600	350	140	200	75	106	70	30	30	30
17	1000	140	600	300	140	200	75	160	70	30	30	30
18	668	221	600	250	140	200	75	125	45	30	30	30
19	430	290	600	250	140	200	75	40	30	30	30	105
20	450	285	600	250	140	200	75	163	30	88	30	210
21	450	360	600	250	111	200	75	180	30	130	30	340
22	450	360	600	250	70	200	34	275	30	130	30	340
23	450	360	600	250	70	200	30	592	30	130	30	340
24	342	360	600	250	70	200	30	800	30	30	30	340
25	250	360	600	250	70	200	30	800	30	110	30	340
26	250	360	600	250	70	200	30	1000	30	150	30	340
27	250	419	600	250	70	200	30	1000	30	105	30	340
28	206	450	600	250	50	200	30	1000	30	30	30	340
29	175	450	600	250	---	200	30	1000	30	30	30	340
30	140	450	506	250	---	200	30	1000	30	30	30	340
31	100	---	450	250	---	200	---	1000	---	30	30	---
TOTAL	15249	6166	16950	10750	3944	4007	4310	9691	5656	1563	930	4255
MEAN	492	206	547	347	141	129	144	313	189	50.4	30.0	142
MAX	1000	450	600	450	250	200	290	1000	775	150	30	340
MIN	100	30	450	250	50	35	30	30	30	30	30	30
AC-FT	30250	12230	33620	21320	7820	7950	8550	19220	11220	3100	1840	8440
CFSM	.88	.37	.97	.62	.25	.23	.26	.56	.34	.09	.05	.25
IN.	1.01	.41	1.12	.71	.26	.27	.29	.64	.37	.10	.06	.28

CAL YR 1986 TOTAL 169528 MEAN 464 MAX 1550 MIN 30 AC-FT 336300 CFSM .83 IN. 11.22
WTR YR 1987 TOTAL 83471 MEAN 229 MAX 1000 MIN 30 AC-FT 165600 CFSM .41 IN. 5.53

CROW WING RIVER BASIN

05243721 STRAIGHT RIVER AT COUNTY HIGHWAY 125 NEAR OSAGE, MN

LOCATION.--Lat 46°54'15", long 95°12'15", in NW¼NW¼ sec.35, T.140 N., R.36 W., Becker County, Hydrologic Unit 07010106, on downstream side of culverts on County Highway 125, 2.7 mi southest of Osage.

PERIOD OF RECORD.--October to November 1986, March to September 1987.

GAGE.--Water-stage recorder. Elevation of gage is 1,435 ft above National Geodetic Vertical Datum of 1929, from topographic map.

REMARKS.--Records fair.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 62 ft^3/s, May 22, gage height, 7.70 ft; maximum gage height, 7.79 ft, July 23; minimum discharge (October to November, March to September), 28 ft^3/s, July 10, gage height, 7.33 ft; minimum gage height, 7.32 ft, June 20, 21, 22, July 4.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	e50	47	---	---	---	---	47	39	47	33	37	36
2	e50	46	---	---	---	---	45	39	46	32	37	35
3	e50	47	---	---	---	---	45	38	45	32	38	36
4	e50	47	---	---	---	---	44	39	42	31	37	35
5	e50	49	---	---	---	---	43	39	41	31	36	40
6	e50	50	---	---	---	---	42	39	40	31	35	41
7	e50	---	---	---	---	---	43	38	40	31	35	40
8	50	---	---	---	---	---	44	38	40	30	35	40
9	49	---	---	---	---	---	44	37	40	30	35	39
10	48	---	---	---	---	---	45	37	39	29	35	39
11	52	---	---	---	---	---	46	37	39	39	34	39
12	51	---	---	---	---	48	44	36	39	41	35	38
13	50	---	---	---	---	48	45	38	39	39	36	39
14	50	---	---	---	---	48	44	40	38	37	36	38
15	50	---	---	---	---	48	43	40	36	35	38	39
16	49	---	---	---	---	47	43	42	35	34	41	39
17	48	---	---	---	---	46	42	46	34	36	39	40
18	48	---	---	---	---	45	42	50	35	45	41	50
19	49	---	---	---	---	46	41	48	34	51	39	52
20	50	---	---	---	---	48	45	47	33	57	38	50
21	50	---	---	---	---	48	45	55	33	56	38	48
22	51	---	---	---	---	48	44	59	33	56	37	46
23	51	---	---	---	---	54	44	54	36	58	36	44
24	50	---	---	---	---	59	42	52	37	55	35	41
25	49	---	---	---	---	58	42	52	38	49	36	40
26	49	---	---	---	---	56	41	56	37	46	37	39
27	50	---	---	---	---	54	40	52	35	44	37	39
28	50	---	---	---	---	51	38	50	34	42	37	39
29	48	---	---	---	---	50	40	50	34	40	36	39
30	46	---	---	---	---	48	39	49	33	39	39	38
31	48	---	---	---	---	46	---	48	---	37	37	---
TOTAL	1536	---	---	---	---	---	1292	1384	1132	1246	1142	1218
MEAN	49.5	---	---	---	---	---	43.1	44.6	37.7	40.2	36.8	40.6
MAX	52	---	---	---	---	---	47	59	47	58	41	52
MIN	46	---	---	---	---	---	38	36	33	29	34	35
AC-FT	3050	---	---	---	---	---	2560	2750	2250	2470	2270	2420

e Estimated

CROW WING RIVER BASIN

05243723 STRAIGHT RIVER AT COUNTY HIGHWAY 115 NEAR PARK RAPIDS, MN

LOCATION.--Lat 46°52'45", long 95°06'12", in SW¼SW¼ sec.4, T.139 N., R.35 W., Hubbard County, Hydrologic Unit 07010106, downstream from culvert on County Highway 115, 4.17 mi southwest of Park Rapids.

PERIOD OF RECORD.--October to November 1986, March to September 1987.

GAGE.--Water-stage recorder. Elevation of gage is 1,420 ft above National Geodetic Vertical Datum of 1929, from topographic map.

REMARKS.--Recoards fair.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 81 ft^3/s, July 22, gage height, 10.94 ft; minimum (October to November, March to September), 36 ft^3/s, Aug. 10, 11, gage height, 10.43 ft; minimum gage height observed, 9.99 ft, Mar. 12, 13.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	e56	59	---	---	---	---	e63	53	58	51	48	45
2	e56	59	---	---	---	---	e62	53	58	48	46	44
3	e56	60	---	---	---	---	e61	53	55	48	47	46
4	e56	62	---	---	---	---	e60	52	54	48	45	45
5	e56	63	---	---	---	---	e60	52	54	49	44	48
6	e56	---	---	---	---	---	e60	51	53	46	43	50
7	e56	---	---	---	---	---	e60	51	53	47	41	50
8	56	---	---	---	---	---	e60	51	53	47	41	49
9	56	---	---	---	---	---	e60	49	53	46	40	49
10	56	---	---	---	---	---	e60	49	54	45	41	48
11	57	---	---	---	---	---	e60	49	51	54	41	48
12	58	---	---	---	---	e65	e60	47	50	57	41	49
13	58	---	---	---	---	e65	e60	48	50	54	42	50
14	57	---	---	---	---	e65	60	50	49	54	43	49
15	57	---	---	---	---	e65	60	50	48	52	48	49
16	56	---	---	---	---	e65	58	50	47	48	55	51
17	56	---	---	---	---	e65	58	56	47	50	49	51
18	56	---	---	---	---	e65	58	62	47	54	49	59
19	57	---	---	---	---	e65	57	59	48	59	49	66
20	58	---	---	---	---	e65	59	58	48	70	47	64
21	58	---	---	---	---	e65	61	68	47	72	47	61
22	58	---	---	---	---	e65	60	76	47	77	46	60
23	59	---	---	---	---	e70	58	69	50	74	45	57
24	60	---	---	---	---	e75	58	64	53	72	44	55
25	59	---	---	---	---	e73	56	64	54	70	44	53
26	58	---	---	---	---	e71	56	71	55	65	44	52
27	58	---	---	---	---	e70	55	66	53	62	45	51
28	58	---	---	---	---	e68	54	62	53	59	45	51
29	59	---	---	---	---	e67	53	60	51	55	44	51
30	59	---	---	---	---	e65	53	60	50	54	46	51
31	59	---	---	---	---	e64	---	60	---	52	46	---
TOTAL	1775	---	---	---	---	---	1760	1763	1543	1739	1396	1552
MEAN	57.3	---	---	---	---	---	58.7	56.9	51.4	56.1	45.0	51.7
MAX	60	---	---	---	---	---	63	76	58	77	55	66
MIN	56	---	---	---	---	---	53	47	47	45	40	44
AC-FT	3520	---	---	---	---	---	3490	3500	3060	3450	2770	3080

e Estimated

CROW WING RIVER BASIN

05243725 STRAIGHT RIVER NEAR PARK RAPIDS, MN

LOCATION.--Lat 46°52'30", long 95°03'56", in NW¼NE¼ sec.11, T.139 N., R.35 W., Hubbard County, Hydrologic Unit 07010106, upstream from culvert on U.S. Highway 71, 3.2 mi south of Park Rapids.

DRAINAGE AREA.--53.2 mi^2.

PERIOD OF RECORD.--Occasional low-flow measurements, water years 1970-71, 1973, 1975-76. October to November 1986, March to September 1987.

GAGE.--Water-stage recorder. Elevation of gage is 1,400 ft above National Geodetic Vertical Datum of 1929, from topographic map.

REMARKS.--Records Good.

EXTREMES OUTSIDE PERIOD OF RECORD.--A discharge of 35 ft^3/s was measured Aug. 4, 1976.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 87 ft^3/s, May 22, gage height, 1.73 ft; maximum gage height, 1.77 ft, Sept. 19; minimum discharge (October to November, March to September), 43 ft^3/s, Aug. 10, 11; minimum gage height, 1.14 ft, June 21, July 10.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	e72	75	---	---	---	---	e69	62	71	53	55	52
2	e72	74	---	---	---	---	e68	61	70	54	54	51
3	e72	75	---	---	---	---	e67	61	68	52	56	51
4	e72	75	---	---	---	---	e67	61	67	51	55	51
5	e72	75	---	---	---	---	e66	62	65	52	54	54
6	e72	79	---	---	---	---	e66	62	64	53	53	56
7	72	---	---	---	---	---	66	62	63	52	51	56
8	71	---	---	---	---	---	67	61	62	51	51	55
9	72	---	---	---	---	---	68	60	62	50	51	55
10	72	---	---	---	---	---	68	61	63	51	50	54
11	73	---	---	---	---	---	68	61	61	58	49	54
12	74	---	---	---	---	69	67	60	62	59	49	54
13	73	---	---	---	---	69	66	61	59	59	50	54
14	73	---	---	---	---	e69	66	62	59	58	51	54
15	73	---	---	---	---	e69	66	62	58	57	56	53
16	73	---	---	---	---	e69	66	62	56	55	62	54
17	73	---	---	---	---	e69	66	67	55	57	57	55
18	73	---	---	---	---	e70	65	73	54	60	56	61
19	73	---	---	---	---	e70	65	71	55	67	55	70
20	74	---	---	---	---	e71	66	69	53	72	54	67
21	75	---	---	---	---	e71	67	79	52	76	53	64
22	75	---	---	---	---	e71	65	85	53	78	53	63
23	76	---	---	---	---	e77	65	80	55	77	52	61
24	76	---	---	---	---	e82	65	76	56	75	51	59
25	76	---	---	---	---	e80	64	77	57	73	50	57
26	76	---	---	---	---	e78	64	81	57	68	50	57
27	75	---	---	---	---	e76	63	79	56	64	51	56
28	76	---	---	---	---	e74	63	75	55	61	51	56
29	76	---	---	---	---	e72	62	74	55	59	50	56
30	75	---	---	---	---	e71	62	74	54	58	52	56
31	75	---	---	---	---	e70	---	74	---	57	53	---
TOTAL	2282	---	---	---	---	---	1973	2115	1777	1867	1635	1696
MEAN	73.6	---	---	---	---	---	65.8	68.2	59.2	60.2	52.7	56.5
MAX	76	---	---	---	---	---	69	85	71	78	62	70
MIN	71	---	---	---	---	---	62	60	52	50	49	51
AC-FT	4530	---	---	---	---	---	3910	4200	3520	3700	3240	3360
CFSM	1.38	---	---	---	---	---	1.24	1.28	1.11	1.13	.99	1.06
IN.	1.60	---	---	---	---	---	1.38	1.48	1.24	1.31	1.14	1.19

e Estimated

CROW WING RIVER BASIN

05245100 LONG PRAIRIE RIVER AT LONG PRAIRIE, MN

LOCATION.--Lat 45°58'30", long 94°51'56", in NE¼NW¼ sec.20, T.129 N., R.33 W., Todd County, Hydrologic Unit 07010108, on right bank 90 ft upstream from bridge on First Avenue at Long Prairie and 400 ft downstream from Venewitz Creek.

DRAINAGE AREA.--432 mi^2.

PERIOD OF RECORD.--October 1971 to current year.

GAGE.--Water-stage recorder. Datum of gage is 1,281.74 ft above National Geodetic Vertical Datum of 1929.

REMARKS.--Records good except those for Nov. 8 to Mar. 13, and May 14-18, 20-26, 28, which are fair.

AVERAGE DISCHARGE.--16 years, 171 ft^3/s, 5.38 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 3,270 ft^3/s, July 22, 1972, gage height, 9.37 ft; minimum daily, 0.84 ft^3/s, Jan. 12-18, 1977.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 794 ft^3/s, Oct. 1, gage height, 5.78 ft, occurred on recession following peak of Sept. 26, 1986; maximum independent peak discharge, 593 cfs, Mar. 27, gage height, 5.08 ft; minimum discharge, 44 ft^3/s, Sept. 15, 16, gage height, 1.44 ft; minimum gage height, 1.43 ft, Sept 3, 4, and 5.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	765	440	e340	e230	e195	e205	369	218	443	98	101	48
2	717	431	e335	e230	e200	e205	337	213	397	105	93	46
3	675	432	e330	e230	e200	e208	318	209	354	100	93	46
4	637	426	e330	e230	e200	e208	307	205	313	98	83	44
5	608	425	e330	e230	e205	e210	297	198	279	101	80	48
6	591	424	e325	e230	e205	e250	293	198	253	100	76	50
7	566	424	e325	e230	e205	e295	293	197	234	95	73	50
8	551	e420	e325	e230	e210	e360	294	191	219	91	72	54
9	534	e415	e320	e230	e210	e490	294	185	206	89	72	52
10	522	e375	e305	e230	e210	e340	298	179	197	87	67	48
11	511	e335	e290	e230	e210	e310	298	174	195	87	66	48
12	505	e310	e280	e230	e210	e380	299	168	189	86	62	46
13	496	e300	e260	e230	e210	e310	300	170	183	90	61	46
14	489	e315	e250	e230	e210	282	301	e200	174	89	61	46
15	483	e345	e245	e230	e210	273	305	e192	159	83	64	44
16	477	e360	e245	e225	e210	265	304	e187	146	80	67	46
17	471	e365	e240	e220	e210	258	298	e182	137	75	66	50
18	464	e365	e240	e220	e210	251	293	e174	133	75	64	72
19	460	e365	e240	e220	e210	255	288	166	128	81	64	80
20	458	e365	e240	e220	e210	267	285	e163	120	90	62	89
21	451	e365	e240	e215	e210	286	287	e235	118	101	62	90
22	451	e360	e235	e210	e210	294	284	e380	112	93	66	78
23	447	e360	e235	e200	e210	352	280	e410	124	91	61	69
24	448	e360	e235	e195	e210	485	270	e415	153	90	58	62
25	444	e360	e235	e195	e210	562	260	e420	181	93	58	58
26	443	e360	e235	e192	e210	581	254	e440	162	148	54	56
27	443	e350	e235	e192	e210	587	248	471	136	141	54	54
28	445	e350	e235	e192	e210	557	242	e480	119	145	54	58
29	442	e350	e235	e192	---	514	231	496	112	152	52	61
30	442	e340	e230	e192	---	415	222	505	103	140	50	58
31	445	---	e230	e192	---	382	---	476	---	116	48	---
TOTAL	15871	11192	8375	6722	5820	10637	8650	8497	5779	3112	2064	1697
MEAN	512	373	270	217	208	343	288	274	193	100	66.6	56.6
MAX	765	440	340	230	210	587	369	505	443	152	101	90
MIN	442	300	230	192	195	205	222	163	103	75	48	44
AC-FT	31480	22200	16610	13330	11540	21100	17160	16850	11460	6170	4090	3370
CFSM	1.19	.86	.63	.50	.48	.79	.67	.63	.45	.23	.15	.13
IN.	1.37	.96	.72	.58	.50	.92	.74	.73	.50	.27	.18	.15

CAL YR 1986 TOTAL 142263 MEAN 390 MAX 1500 MIN 85 AC-FT 282200 CFSM .90 IN. 12.25
WTR YR 1987 TOTAL 88416 MEAN 242 MAX 765 MIN 44 AC-FT 175400 CFSM .56 IN. 7.61

e Estimated

CROW WING RIVER BASIN

05246500 GULL LAKE NEAR BRAINERD, MN

LOCATION.--Lat 46°24'40", long 94°21'26", in NE sec.20, T.134 N., R.29 W., Cass County, Hydrologic Unit 07010106, in pool of dam on Gull River, 800 ft south of outlet of Gull Lake, 0.2 mi upstream from Gull Lake Dam, and 8 mi northwest of Brainerd.

DRAINAGE AREA.--287 mi^2.

PERIOD OF RECORD.--August 1911 to current year. Prior to October 1941 monthend contents only, published in WSP 1308. Published as Gull Lake Reservoir October 1941 to September 1956.

GAGE.--Water-stage recorder. Datum of gage is National Geodetic Vertical Datum of 1929 (levels by U.S. Army Corps of Engineers). Prior to Aug. 10, 1949, nonrecording gage 800 ft north of present site at same datum. Aug. 11, 1949, to June 30, 1973, water-stage recorder at present site and at datum 1,188.14 ft, adjustment of 1912.

REMARKS.--Reservoir is formed by Gull Lake and several other natural lakes controlled by concrete dam completed in 1913; storage began in 1912. Capacity between elevation 1,192.75 ft and 1,194.75 ft (maximum allowable range and normal operating range) is 26,008 acre-ft. Contents shown herein are contents above elevation 1,188.00 ft. Prior to September 1978, published contents as contents above elevation 1,188.75 ft. Water is used to benefit navigation on Mississippi River below Minneapolis.

COOPERATION.--Records were provided by U.S. Army Corps of Engineers.

EXTREMES FOR PERIOD OF RECORD.--Maximum contents, 74,800 acre-ft, capacity table then in use, June 30, 1914, elevation, 1,195.05 ft; minimum observed, 22,250 acre-ft, capacity table then in use, Mar. 20, 1924, elevation, 1,190.75 ft.

EXTREMES FOR CURRENT YEAR.--Maximum contents, 62,850 acre-ft, May 22, elevation, 1,194.14 ft; minimum, 53,220 acre-ft, Feb. 13, elevation, 1,193.40 ft.

MONTHEND ELEVATION AND CONTENTS, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

Date	Elevation (feet)	Contents (acre-feet)	Change in contents (acre-feet)
Sept. 30, 1986	1,194.01	61,150	
Oct. 31	1,193.52	54,770	-6,380
Nov. 30	1,193.58	55,550	780
Dec. 31	1,193.55	55,160	-390
CAL YR 1986			-2,340
Jan. 31, 1987	1,193.49	54,390	-770
Feb. 28	1,193.47	54,130	-260
Mar. 31	1,193.90	59,720	5,590
Apr. 30	1,193.90	59,720	0
May 31	1,193.95	60,360	640
June 30	1,193.74	57,630	-2,730
July 31	1,193.78	58,150	520
Aug. 31	1,193.54	55,030	-3,120
Sept. 30	1,193.71	57,240	2,210
WTR YR 1987			-3,910

CROW WING RIVER BASIN

05247000 GULL RIVER AT GULL LAKE DAM, NEAR BRAINERD, MN

LOCATION.--Lat 46°24'40", long 94°21'12", in sec.20, T.134 N., R.29 W., Cass County, Hydrologic Unit 07010106, in headwater and tailwater of dam at outlet of Gull Lake, 8 mi northwest of Brainerd.

DRAINAGE AREA.--287 mi^2.

PERIOD OF RECORD.--August 1911 to current year. Monthly discharge only for some periods, published in WSP 1308. Published as "Gull Lake Reservoir" 1929.

GAGE.--Water-stage recorder on headwater and nonrecording gage on tailwater. Datum of gages is National Geodetic Vertical Datum of 1929 (levels by U.S. Army Corps of Engineers). August 1911 to May 23, 1929, and Dec. 1, 1929, to Aug 1, 1949, both gages were nonrecording gages at same site and datum in use. May 24 to Nov. 30, 1929, nonrecording gage 500 ft downstream at different datum. Aug. 2, 1949, to June 30, 1973, at present sites with datum of gage at 1,188.14 ft, adjustment of 1912.

REMARKS.--Discharge computed at dam on basis of modified weir formulas, the head being obtained from twice-daily readings on tailwater gage and from headwater recorder. Flow completely regulated by Gull Lake (station 05246500).

COOPERATION.--Computations of daily discharge were provided by U.S. Army Corps of Engineers.

AVERAGE DISCHARGE (unadjusted).--76 years, 110 ft^3/s, 5.20 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum daily discharge, 1,120 ft^3/s, May 15, 1938; no flow at times.

EXTREMES FOR CURRENT YEAR.--Maximum daily discharge, 485 ft^3/s, May 26; minimum daily, 18 ft^3/s, July 30, 31, Aug. 1, 2, 5-10, 12-15, 17, 23, 29-31, Sept. 1-4, 6-14, 16, 17, 25, 28.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	462	175	142	143	142	27	298	41	288	20	18	18
2	235	175	142	143	142	27	294	41	224	20	18	18
3	235	175	143	143	142	27	297	41	193	20	20	18
4	235	117	143	143	142	27	294	41	111	20	19	18
5	235	117	143	143	143	27	292	41	53	20	18	19
6	235	117	143	143	143	27	291	29	53	20	18	18
7	235	117	143	143	143	27	290	21	53	20	18	18
8	235	119	143	143	143	27	213	20	53	20	18	18
9	235	119	143	143	143	27	161	21	52	20	18	18
10	235	120	142	143	143	27	161	21	52	19	18	18
11	235	117	143	143	142	27	115	21	52	19	19	18
12	235	117	141	143	142	27	76	21	52	20	18	18
13	235	140	142	143	142	27	82	21	52	20	18	18
14	235	140	143	143	142	27	82	21	52	20	18	18
15	235	140	144	143	142	27	82	21	51	20	18	20
16	235	143	143	142	142	27	82	44	51	20	19	18
17	235	143	143	142	142	28	82	60	51	19	18	18
18	235	143	143	142	142	27	56	61	33	19	19	19
19	235	143	143	142	142	27	40	145	20	20	19	20
20	235	142	143	142	142	27	40	200	20	20	19	20
21	235	142	143	142	109	38	40	200	20	20	19	20
22	235	142	143	142	71	50	40	201	20	20	19	20
23	235	142	143	142	71	50	40	395	20	20	18	20
24	235	142	143	142	71	102	40	481	20	20	19	19
25	235	142	144	142	71	231	40	481	20	20	19	18
26	235	142	143	142	71	301	41	485	20	20	19	19
27	235	142	143	142	72	303	41	435	20	20	19	19
28	175	142	143	142	42	300	41	362	20	19	19	18
29	175	142	143	142	---	300	41	294	20	19	18	19
30	175	142	143	142	---	297	41	294	20	18	18	19
31	175	---	143	142	---	298	---	291	---	18	18	---
TOTAL	7272	4139	4429	4417	3424	2811	3735	4851	1766	610	573	559
MEAN	235	138	143	142	122	90.7	124	156	58.9	19.7	18.5	18.6
MAX	462	175	144	143	143	303	298	485	288	20	20	20
MIN	175	117	141	142	42	27	40	20	20	18	18	18
AC-FT	14420	8210	8780	8760	6790	5580	7410	9620	3500	1210	1140	1110
CFSM	.82	.48	.50	.50	.43	.32	.43	.55	.21	.07	.06	.06
IN.	.94	.54	.57	.57	.44	.36	.48	.63	.23	.08	.07	.07

CAL YR 1986 TOTAL 84769 MEAN 232 MAX 672 MIN 21 AC-FT 168100 CFSM .81 IN. 10.99
WTR YR 1987 TOTAL 38586 MEAN 106 MAX 485 MIN 18 AC-FT 76540 CFSM .37 IN. 5.00

MISSISSIPPI RIVER MAIN STEM

05267000 MISSISSIPPI RIVER NEAR ROYALTON, MN

LOCATION.--Lat 45°51'41", long 94°21'33", in lot 2, sec.20, T.39 N., R.32 W., Morrison County, Hydrologic Unit 07010104, at plant of Minnesota Power Co., 4 mi northwest of Royalton, 4.5 mi downstream from Swan River, and at mile 956 upstream from Ohio River.

DRAINAGE AREA.--11,600 mi^2, approximately.

WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--March 1924 to current year.

REMARKS.--No estimated daily discharges. Records fair. Discharge computed based on powerplant records. Flow partly regulated by powerplants and Winnibigoshish, Leech, Pokegama, Sandy, and Gull Lakes and by Pine River Reservoir (see stations 05201000, 05206000, 05210500, 05218500, 05230500, 05246500).

COOPERATION.--Records collected by Minnesota Power Co. under general supervision of Geological Survey, in connection with a Federal Power Commission project.

AVERAGE DISCHARGE.--63 years, 4,639 ft^3/s, 5.43 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum daily discharge, 37,700 ft^3/s, Apr. 16, 1965; minimum daily, 254 ft^3/s, Nov. 25, 1936.

EXTREMES FOR CURRENT YEAR.--Maximum daily discharge, 16,000 ft^3/s, Oct. 1, occurred on recession following peak of Sept. 25, 1986; maximum independent daily discharge, 10,800 ft^3/s, May 26, 27; minimum daily, 1,260 ft^3/s, July 17.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	16000	7220	7220	4630	3560	3330	7640	3130	9920	1930	5260	1890
2	15000	6300	7220	4680	3540	3300	7010	2800	9260	2010	5020	2010
3	14300	6750	7220	4150	3740	3110	6340	2720	8930	1980	4880	1760
4	13600	6300	5480	4640	3590	3330	5550	2540	8500	1600	4590	1960
5	12400	6300	5480	4460	3320	3380	6140	2480	9120	1540	4200	2210
6	12200	6520	5280	4770	3830	3660	5640	2490	7410	1720	4100	2030
7	12100	6300	6090	4120	3420	4690	5360	2590	6690	1800	3600	2110
8	11500	6520	5380	4350	3520	4610	5430	2330	6040	1600	3820	2000
9	11200	6750	5090	4570	3730	4580	5420	2110	5280	1620	2970	2040
10	10800	7220	4520	4470	3520	4550	4980	2300	4830	1680	2850	1680
11	10700	6300	3990	4290	3440	4900	5590	2240	5010	1480	2540	1800
12	10600	5280	4520	4160	3670	4930	5150	1700	4370	1650	2790	1860
13	9780	4900	4710	4410	3560	4910	5120	1880	4780	1580	2860	1810
14	9580	3480	5280	4500	3130	4610	5170	1950	3660	1650	1840	1640
15	9620	5680	5280	4270	3510	4200	4700	2120	3870	1570	2910	1710
16	9100	5680	5280	3960	3640	4200	4650	1670	3130	1370	2370	1830
17	9510	6300	5480	3770	3440	3660	4530	1940	3650	1260	2460	2060
18	9210	6520	5480	4010	3370	4150	4750	2480	3090	1360	2380	2130
19	9060	6300	5480	3890	3360	3330	4050	2440	3150	1390	2820	2730
20	8860	6300	5480	3480	3310	3760	4160	3120	2680	1830	2530	2580
21	8290	6520	5280	3400	3540	4320	4090	4300	2580	2210	2460	2580
22	8060	6980	5090	3460	3260	4380	3970	6340	3130	2250	2430	2840
23	7830	6980	5280	3360	3200	5260	3450	7240	3430	3190	2290	2670
24	7770	6300	5280	3370	3250	5590	3440	8580	2400	3370	2370	3310
25	7680	6980	5280	3330	3150	7900	3440	10100	2410	3530	2590	2990
26	7360	6980	5280	3560	3240	8760	3080	10800	2070	4520	2330	2670
27	7530	6750	5280	3410	3470	8440	3500	10800	2210	4030	2400	2770
28	7390	6980	5090	3340	3360	8190	2940	10300	2140	4530	2290	3560
29	7510	6980	5280	3320	---	8090	2600	10500	2230	4460	2320	3250
30	7350	6980	5090	3350	---	7810	3070	10400	2010	5150	2240	3740
31	7140	---	5280	3360	---	7140	---	10100	---	5210	2140	---
TOTAL	309130	191350	167770	122840	96670	157130	140760	146490	137980	75070	92650	70220
MEAN	9972	6378	5412	3963	3452	5069	4692	4725	4599	2422	2989	2341
MAX	16000	7220	7220	4770	3830	8760	7640	10800	9920	5210	5260	3740
MIN	7140	3480	3990	3320	3130	3110	2600	1670	2010	1260	1840	1640
AC-FT	613200	379500	332800	243700	191700	311700	279200	290600	273700	148900	183800	139300
CFSM	.86	.55	.47	.34	.30	.44	.40	.41	.40	.21	.26	.20
IN.	.99	.61	.54	.39	.31	.50	.45	.47	.44	.24	.30	.23

CAL YR 1986 TOTAL 3320550 MEAN 9097 MAX 23500 MIN 2760 AC-FT 6586000 CFSM .78 IN. 10.65
WTR YR 1987 TOTAL 1708060 MEAN 4680 MAX 16000 MIN 1260 AC-FT 3388000 CFSM .40 IN. 5.48

05267000 MISSISSIPPI RIVER NEAR ROYALTON, MN-Continued
(National stream-quality accounting network station)

WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1964-66, 1975 to current year.

REMARKS.--Letter K indicates non-ideal colony count.

WATER QUALITY DATA, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	TIME	DIS-CHARGE, IN CUBIC FEET PER SECOND (00060)	STREAM-FLOW, INSTAN-TANEOUS (CFS) (00061)	SPE-CIFIC CON-DUCT-ANCE (US/CM) (00095)	SPE-CIFIC CON-DUCT-ANCE LAB (US/CM) (90095)	PH (STAND-ARD UNITS) (00400)	PH LAB (STAND-ARD UNITS) (00403)	TEMPER-ATURE AIR (DEG C) (00020)	TEMPER-ATURE WATER (DEG C) (00010)	TUR-BID-ITY (FTU) (00076)	BARO-METRIC PRES-SURE (MM OF HG) (00025)	OXYGEN, DIS-SOLVED (MG/L) (00300)
DEC 17...	1200	--	5360	312	314	7.8	7.9	-3.0	0.5	1.8	747	12.5
JAN 14...	1030	4500	--	305	341	7.7	7.7	1.0	0.5	2.3	759	11.5
MAR 31...	1115	7140	--	271	292	8.5	7.9	--	2.5	2.2	755	14.8
JUL 28...	1000	4530	--	300	289	8.4	8.5	23.0	26.0	24	758	8.7
SEP 22...	1130	--	3430	291	303	8.5	8.1	--	--	2.8	--	--

DATE	COLI-FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML) (31625)	STREP-TOCOCCI FECAL, KF AGAR (COLS. PER 100 ML) (31673)	CALCIUM DIS-SOLVED (MG/L AS CA) (00915)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG) (00925)	SODIUM, DIS-SOLVED (MG/L AS NA) (00930)	POTAS-SIUM, DIS-SOLVED (MG/L AS K) (00935)	ALKA-LINITY WAT DIS TOT IT FIELD MG/L AS CACO3 (39086)	CAR-BONATE WATER DIS IT FIELD MG/L AS CO3 (00452)	BICAR-BONATE WATER DIS IT FIELD MG/L AS HCO3 (00453)	SULFATE DIS-SOLVED (MG/L AS SO4) (00945)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL) (00940)	FLUO-RIDE, DIS-SOLVED (MG/L AS F) (00950)
DEC 17...	280	120	44	15	5.5	1.8	210	0	256	14	4.4	0.1
JAN 14...	<1	52	44	15	5.5	1.7	163	0	199	11	3.8	<0.1
MAR 31...	K10	K10	38	11	4.4	3.6	130	0	159	11	6.6	0.1
JUL 28...	27	170	37	14	6.4	1.8	148	2	176	19	4.2	0.2
SEP 22...	K16	100	39	14	6.3	2.1	149	--	--	16	4.3	0.1

DATE	SILICA, DIS-SOLVED (MG/L AS SIO2) (00955)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L) (70300)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N) (00631)	NITRO-GEN, AMMONIA DIS-SOLVED (MG/L AS N) (00608)	NITRO-GEN,AM-MONIA + ORGANIC TOTAL (MG/L AS N) (00625)	PHOS-PHOROUS TOTAL (MG/L AS P) (00665)	PHOS-PHOROUS DIS-SOLVED (MG/L AS P) (00666)	PHOS-PHOROUS ORTHO, DIS-SOLVED (MG/L AS P) (00671)	SEDI-MENT, SUS-PENDED (MG/L) (80154)	SEDI-MENT, DIS-CHARGE, SUS-PENDED (T/DAY) (80155)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM (70331)
DEC 17...	11	193	0.28	0.06	0.4	0.03	0.03	0.01	--	--	--
JAN 14...	11	194	0.36	0.07	0.5	0.02	0.01	<0.01	4	49	76
MAR 31...	9.3	171	0.39	0.13	1.1	0.07	0.02	<0.01	6	116	92
JUL 28...	7.6	182	<0.10	0.02	0.9	0.05	0.02	<0.01	11	135	100
SEP 22...	8.0	178	<0.10	<0.01	0.7	0.04	0.03	<0.01	--	--	--

05267000 MISSISSIPPI RIVER NEAR ROYALTON, MN-Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	TIME	ALUMINUM, DISSOLVED (UG/L AS AL) (01106)	ARSENIC DISSOLVED (UG/L AS AS) (01000)	BARIUM, DISSOLVED (UG/L AS BA) (01005)	BERYLLIUM, DISSOLVED (UG/L AS BE) (01010)	CADMIUM DISSOLVED (UG/L AS CD) (01025)	CHROMIUM, DISSOLVED (UG/L AS CR) (01030)	COBALT, DISSOLVED (UG/L AS CO) (01035)	COPPER, DISSOLVED (UG/L AS CU) (01040)	IRON, DISSOLVED (UG/L AS FE) (01046)	LEAD, DISSOLVED (UG/L AS PB) (01049)
DEC 17...	1200	10	<1	47	<0.5	<1	<1	<3	1	220	<5
JAN 14...	1030	<10	1	46	<0.5	<1	<1	<3	1	170	<5
MAR 31...	1115	<10	<1	41	<0.5	<1	<1	<3	2	300	<5
SEP 22...	1130	<10	1	44	<0.5	<1	<1	<3	<1	13	<5

DATE	LITHIUM DISSOLVED (UG/L AS LI) (01130)	MANGANESE, DISSOLVED (UG/L AS MN) (01056)	MERCURY DISSOLVED (UG/L AS HG) (71890)	MOLYBDENUM, DISSOLVED (UG/L AS MO) (01060)	NICKEL, DISSOLVED (UG/L AS NI) (01065)	SELENIUM, DISSOLVED (UG/L AS SE) (01145)	SILVER, DISSOLVED (UG/L AS AG) (01075)	STRONTIUM, DISSOLVED (UG/L AS SR) (01080)	VANADIUM, DISSOLVED (UG/L AS V) (01085)	ZINC, DISSOLVED (UG/L AS ZN) (01090)
DEC 17...	7	38	<0.1	<10	<1	<1	<1	84	<6	9
JAN 14...	9	41	0.2	<10	<1	<1	<1	80	<6	17
MAR 31...	11	52	<0.1	<10	<1	<1	<1	67	<6	22
SEP 22...	<4	8	0.3	<10	<1	1	<1	86	<6	12

ELK RIVER BASIN

05275000 ELK RIVER NEAR BIG LAKE, MN

LOCATION.--Lat 45°20'02", long 93°40'00", in NE¼SW¼ sec.23, T.33 N., R.27 W., Sherburne County, Hydrologic Unit 07010203, on right bank at upstream side of highway bridge, 4 mi east of Big Lake and 4 mi downstream from St. Francis River.

DRAINAGE AREA.--615 mi^2.

PERIOD OF RECORD.--April 1911 to September 1917, April to September 1931, April to November 1932, March to November 1933, March 1934 to September 1987 (discontinued).

REVISED RECORDS.--WSP 895: 1939. WSP 1308: 1912(M), 1915-17(M).

GAGE.--Water-stage recorder. Datum of gage is 899.60 ft above National Geodetic Vertical Datum of 1929. April 1911 to Sept. 30, 1917, April 1, 1931, to July 26, 1934, nonrecording gage at same site and datum.

REMARKS.--Records good except those for Nov. 9, 10, 12-26, Dec. 6 to Jan. 15, Jan. 17 to Mar. 3, which are fair.

AVERAGE DISCHARGE.--59 years (water years 1912-17, 1935-87), 275 ft^3/s, 6.07 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 7,360 ft^3/s, Apr. 16, 1965, gage height, 10.86 ft; minimum 3.6 ft^3/s, July 31, 1934.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 2,060 ft^3/s, Oct. 1, gage height, 5.59 ft, occurred on recession following peak of Sept. 26, 1986; maximum independent peak discharge, 590 ft^3/s, Mar. 27, gage height, 2.30 ft; minimum discharge, 56 ft^3/s, July 20, gage height, 0.67 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1960	381	284	e230	e215	e196	313	164	155	68	107	83
2	1770	379	285	e225	e220	e196	280	173	143	66	98	77
3	1600	380	287	e225	e220	e196	259	171	132	63	94	78
4	1390	377	264	e225	e225	196	242	164	122	63	91	75
5	1170	378	261	e222	e225	206	233	162	116	62	88	74
6	977	375	e260	e220	e220	219	227	160	111	64	81	72
7	846	374	e260	e220	e220	244	222	156	106	64	72	68
8	755	396	e260	e220	e215	259	217	153	116	66	67	69
9	689	e275	e260	e220	e215	258	215	159	120	63	77	69
10	616	e260	e260	e220	e215	245	211	191	119	74	79	68
11	561	352	e260	e215	e210	254	210	210	128	77	76	69
12	556	e345	e260	e215	e210	247	210	209	127	91	90	74
13	541	e329	e255	e210	e205	242	210	204	120	95	137	79
14	519	e325	e255	e210	e205	236	210	188	113	88	133	77
15	497	e320	e255	e210	e200	228	210	172	106	85	133	74
16	488	e320	e250	211	e200	221	211	150	97	78	179	74
17	493	e315	e250	e210	e200	217	211	142	99	69	194	93
18	501	e315	e250	e210	e200	214	210	135	106	62	176	110
19	508	e315	e250	e210	e200	214	205	144	97	62	162	114
20	519	e310	e245	e210	e200	217	201	155	93	59	151	116
21	524	e305	e245	e210	e200	222	200	180	91	75	139	116
22	524	e300	e245	e210	e200	247	200	193	89	88	129	108
23	518	e300	e240	e210	e200	311	196	195	68	85	120	101
24	513	e295	e240	e210	e200	372	189	188	86	92	110	96
25	513	e290	e240	e210	e196	433	185	186	83	88	103	93
26	502	e290	e240	e210	e196	515	181	199	77	96	99	89
27	474	289	e235	e210	e196	580	176	201	71	114	96	82
28	440	288	e235	e210	e196	580	174	195	73	108	96	78
29	409	291	e230	e210	---	528	169	185	82	108	93	76
30	396	287	e230	e210	---	453	163	190	73	116	96	74
31	388	---	e230	e210	---	371	---	179	---	113	88	---
TOTAL	22157	9756	7821	6648	5804	9117	6340	5463	3139	2502	3454	2526
MEAN	715	325	252	214	207	294	211	176	105	80.7	111	84.2
MAX	1960	396	287	230	225	580	313	210	155	116	194	116
MIN	388	260	230	210	196	196	163	135	71	59	67	68
AC-FT	43950	19350	15510	13190	11510	18080	12580	10840	6230	4960	6850	5010
CFSM	1.16	.53	.41	.35	.34	.48	.34	.29	.17	.13	.18	.14
IN.	1.34	.59	.47	.40	.35	.55	.38	.33	.19	.15	.21	.15

CAL YR 1986 TOTAL 244851 MEAN 671 MAX 2980 MIN 213 AC-FT 485700 CFSM 1.09 IN. 14.81
WTR YR 1987 TOTAL 84727 MEAN 232 MAX 1960 MIN 59 AC-FT 168100 CFSM .38 IN. 5.12

e Estimated

CROW RIVER BASIN

05278000 MIDDLE FORK CROW RIVER NEAR SPICER, MN

LOCATION.--Lat 45°15'45", long 94°48'10", in NE¼ sec.27, T.121 N., R.33 W., Kandiyohi County, Hydrologic Unit 07010204, on right bank 75 ft upstream from highway bridge, 1.5 mi downstream from Lake Calhoun, 3 mi downstream from Green Lake, and 6.8 mi northeast of Spicer.

DRAINAGE AREA.--179 mi^2, approximately.

PERIOD OF RECORD.--March 1949 to current year.

REVISED RECORDS.--WSP 1508: 1949(M), 1950.

GAGE.--Water-stage recorder and concrete and steel sharp-crested V-notch weir. Datum of gage is 1,147.93 ft above National Geodetic Vertical Datum of 1929 (Kandiyohi County Highway Department bench mark). Prior to July 20, 1950, nonrecording gage at bridge 75 ft downstream at same datum.

REMARKS.--Records good except those for Nov. 8-14, Nov. 22 to 25, 27 to Dec. 3, Dec. 11-13, and Jan. 15-25, which are fair.

AVERAGE DISCHARGE.--38 years, 66.5 ft^3/s, 5.05 in/yr; median of yearly mean discharges, 58 ft^3/s, 4.40 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 571 ft^3/s, July 28, 1986, gage height, 6.47 ft; maximum gage height, 6.67 ft, June 25, 1957; no flow Mar. 15-24, 1949, Feb. 26 to Mar. 26, 1960, Dec. 8, 1963, Feb. 10-21, 1965, Feb. 19-28, 1968, Jan. 11-30, 1975.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 430 ft^3/s, Oct. 3, gage height, 5.68 ft, minimum discharge, 6.9 ft^3/s, Sept. 26, 27, 28, 29, 30, gage height, 2.35 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	417	231	e145	93	81	80	125	78	129	64	35	13
2	421	227	e145	111	82	80	122	74	130	63	33	12
3	429	224	e145	110	79	79	120	73	128	60	31	11
4	427	217	123	107	79	79	120	74	121	56	29	10
5	423	213	144	105	79	78	119	75	112	58	26	11
6	407	210	144	105	79	80	116	75	106	56	25	11
7	398	204	143	105	81	82	115	72	103	54	24	11
8	391	e199	143	105	81	84	115	69	99	52	24	11
9	381	e199	143	104	81	81	113	70	92	49	25	9.8
10	371	e198	140	103	80	80	113	66	88	49	22	9.8
11	367	e195	e134	102	81	81	111	65	91	53	20	9.8
12	363	e183	e131	100	83	81	110	59	90	55	22	9.3
13	356	e164	e131	98	82	79	110	57	90	51	20	9.3
14	348	e159	130	97	80	76	107	58	88	48	19	8.9
15	340	156	130	e80	79	76	104	54	84	46	20	8.5
16	332	152	131	e79	79	78	108	54	80	43	24	8.9
17	323	149	132	e78	80	77	109	51	79	41	21	9.8
18	310	147	134	e77	80	76	107	43	77	40	20	10
19	301	147	132	e77	79	79	103	43	74	39	19	11
20	294	146	131	e77	79	82	108	44	76	38	18	11
21	288	146	130	e78	80	83	105	81	72	39	17	10
22	283	e146	129	e80	81	88	102	87	69	37	17	9.8
23	279	e146	127	e75	79	104	101	86	81	36	16	9.3
24	272	e146	127	e73	79	111	94	89	86	34	14	8.9
25	265	e146	125	e73	78	118	90	95	85	33	14	8.5
26	260	145	124	e75	78	119	91	110	82	38	14	7.3
27	255	e145	123	79	78	118	92	117	77	34	14	7.1
28	251	e145	120	79	78	119	88	121	74	32	16	7.1
29	246	e145	119	80	---	114	86	124	70	32	14	7.2
30	239	e145	117	81	---	117	81	128	67	40	14	7.2
31	234	---	117	81	---	122	---	130	---	36	14	---
TOTAL	10271	5175	4089	2767	2235	2801	3185	2422	2700	1406	641	288.5
MEAN	331	172	132	89.3	79.8	90.4	106	78.1	90.0	45.4	20.7	9.62
MAX	429	231	145	111	83	122	125	130	130	64	35	13
MIN	234	145	117	73	78	76	81	43	67	32	14	7.1
AC-FT	20370	10260	8110	5490	4430	5560	6320	4800	5360	2790	1270	572
CFSM	1.85	.96	.74	.50	.45	.50	.59	.44	.50	.25	.12	.05
IN.	2.13	1.08	.85	.58	.46	.58	.66	.50	.56	.29	.13	.06

CAL YR 1986 TOTAL 96049 MEAN 263 MAX 569 MIN 68 AC-FT 190500 CFSM 1.47 IN. 19.96
WTR YR 1987 TOTAL 37980.5 MEAN 104 MAX 429 MIN 7.1 AC-FT 75330 CFSM .58 IN. 7.89

e Estimated

CROW RIVER BASIN

05280000 CROW RIVER AT ROCKFORD, MN

LOCATION.--Lat 45°05'12", long 93°44'02", in sec.29, T.119 N., R.24 W., Hennepin County, Hydrologic Unit 07010204, on right bank at Rockford, 150 ft downstream from bridge on State Highway 55 and 1 mi downstream from confluence of North and South Forks.

DRAINAGE AREA.--2,520 mi^2, approximately.

PERIOD OF RECORD.--April to July 1906 (published as "near Dayton"), June 1909 to September 1917, April to November 1929, March 1930 to September 1931, April to November 1932, March to November 1933, March 1934 to current year. Monthly discharge only for some periods, published in WSP 1308.

REVISED RECORDS.--WSP 1115: 1932. WSP 1508: 1933. WDR MN-77-2: 1972 (M)(m).

GAGE.--Water-stage recorder. Datum of gage is 893.08 ft above National Geodetic Vertical Datum of 1929. Apr. 13 to July 21, 1906, nonrecording gage at Berning Mill 14 mi downstream at different datum. June 4, 1909, to Sept. 30, 1917, nonrecording gage at site 600 ft downstream at different datum. Apr. 23, 1929, to Aug. 21, 1934, nonrecording gage at site 600 ft downstream at present datum.

REMARKS.--Records good except for estimated daily discharges, which are fair.

AVERAGE DISCHARGE.--62 years (water years 1910-17, 1931, 1935-87), 741 ft^3/s, 3.99 in/yr; median of yearly mean discharges, 552 ft^3/s, 2.97 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 22,400 ft^3/s, Apr. 16, 1965, gage height, 19.27 ft, from floodmark; minimum, 1.8 ft^3/s, Nov. 15, 1936, gage height, 1.05 ft, caused by ice jam upstream.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 5,560 ft^3/s, Oct. 1, gage height, 9.56 ft, was not independent of the peak discharge that occurred Sept. 30, 1986; maximum independent peak discharge, 988 ft^3/s, Mar. 29, gage height, 3.70 ft; maximum independent gage height, 3.72 ft, Mar. 28; minimum discharge, 119 ft^3/s, Sept. 11, gage height, 2.05 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	5510	1830	1080	647	e355	524	967	546	724	473	932	206
2	5430	1770	1080	645	e355	e525	946	531	705	422	918	194
3	5340	1730	1070	574	e355	e530	933	521	681	378	880	179
4	5230	1670	964	497	e355	533	916	510	660	339	853	166
5	5060	1630	839	492	e350	563	895	498	636	331	851	154
6	4900	1600	e869	483	346	643	875	483	602	320	811	145
7	4700	1560	e911	487	344	734	857	469	564	297	733	136
8	4500	1550	e862	533	349	764	840	451	536	286	653	130
9	4320	1480	e800	e551	358	675	828	429	508	281	606	128
10	4150	1410	783	e569	343	651	822	418	491	282	560	126
11	3990	1220	761	e545	351	652	822	403	500	281	501	120
12	3900	1030	e830	e501	347	617	822	384	490	328	464	125
13	3780	855	e1000	e455	359	592	816	372	466	373	455	128
14	3660	1130	e1000	e490	379	587	807	362	437	444	451	132
15	3520	1250	e955	e520	e404	589	805	354	409	494	426	126
16	3400	1250	e904	e540	e399	584	792	337	379	514	499	129
17	3270	1230	e876	e520	e390	567	793	322	360	522	524	133
18	3140	1200	e840	e495	e390	565	787	326	356	517	547	144
19	3010	1170	e845	e475	e385	573	765	348	346	500	527	152
20	2890	1100	e862	e450	e394	585	742	315	338	453	499	176
21	2770	1150	854	e430	406	599	724	306	365	660	459	198
22	2660	1130	788	415	409	619	717	308	385	612	416	201
23	2550	1140	752	e400	407	667	706	308	366	507	376	194
24	2450	1150	680	e390	413	702	698	334	348	777	341	184
25	2350	1090	671	e380	e430	736	686	465	432	715	312	177
26	2270	1130	686	e373	460	830	675	562	487	772	286	170
27	2180	1150	729	e370	484	921	653	595	530	814	270	160
28	2110	1100	708	e370	496	965	615	627	548	807	257	150
29	2040	1100	640	e370	---	979	589	658	546	786	258	141
30	1970	1090	637	e365	---	981	568	705	520	859	241	136
31	1900	---	657	e360	---	982	---	721	---	892	223	---
TOTAL	108950	38895	25904	14692	10818	21034	23463	13966	14715	16036	16129	4640
MEAN	3515	1296	836	474	386	679	782	451	490	517	520	155
MAX	5510	1830	1080	647	496	982	967	721	724	892	932	206
MIN	1900	855	637	360	344	524	568	306	338	281	223	120
AC-FT	216100	77150	51380	29140	21460	41720	46540	27710	29190	31810	31990	9200
CFSM	1.39	.51	.33	.19	.15	.27	.31	.18	.19	.21	.21	.06
IN.	1.61	.57	.38	.22	.16	.31	.35	.21	.22	.24	.24	.07

CAL YR 1986 TOTAL 990459 MEAN 2714 MAX 8750 MIN 390 AC-FT 1965000 CFSM 1.08 IN. 14.62
WTR YR 1987 TOTAL 309244 MEAN 847 MAX 5510 MIN 120 AC-FT 613400 CFSM .34 IN. 4.57

e Estimated

RUM RIVER BASIN

05284000 MILLE LACS LAKE AT GARRISON, MN

LOCATION.--Lat 46°18'05", long 93°49'05", in SW¼SE¼ sec.12, T.44 N., R.28 W., Crow Wing County, Hydrologic Unit 07010207, at pumphouse of Minnesota Division of Game and Fish, 0.2 mi southwest of Borden Lake outlet and 0.8 mi northeast of Garrison.

PERIOD OF RECORD.--June 1931 to current year. Monthend records for the period October 1939 to September 1953 published in WSP 1278 (fragmentary 1940-41). Prior to October 1939, published as "at Wealthwood."

GAGE.--Water-stage recorder. Datum of gage is 1,240.40 ft above National Geodetic Vertical Datum of 1929. Gage readings have been reduced to elevations NGVD. Prior to Oct. 1, 1941, nonrecording gage at Wealthwood, 8.3 mi northeast of present site, at various datums; gage readings have been reduced to elevations, adjustment of 1912. October 1, 1941, to Sept. 30, 1958, water-stage recorder at datum 1,240.50 ft, adjustment of 1912. To convert these records to National Geodetic Vertical Datum of 1929, subtract 0.10 ft.

REMARKS.--Water level affected by fixed-crest spillway constructed in 1953 at outlet of Ogechie Lake, 2.7 mi downstream from outlet of Mille Lacs Lake, with crest at elevation 1,250.50 ft. Water level subject to fluctuation caused by change in direction and velocity of wind and by seiches.

EXTREMES FOR PERIOD OF RECORD.--Maximum elevation, 1,253.87 ft, Aug. 14, 1972, affected by wind action and seiche action; maximum daily, 1,253.43 ft, Aug. 22, 1972; minimum observed, 1,245.74 ft, Oct. 16-19, 1936.

EXTREMES FOR CURRENT YEAR.--Maximum elevation, 1,253.09 ft, Oct. 2, affected by wind action and seiche action; maximum daily, 1,253.05 ft, Oct. 2, minimum, 1,250.54 ft, Aug. 30, affected by wind action and seiche action; minimum daily, 1,250.65 ft, Sept. 29.

MONTHEND ELEVATION, IN FEET NGVD, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

Oct. 31	1,252.61	Feb. 28	1,251.95	June 30	1,251.31
Nov. 30	1,252.40	Mar. 31	1,251.80	July 31	1,251.18
Dec. 31	1,252.23	May 31	1,251.65	Aug. 31	1,250.66
Jan. 31	1,252.10			Sept. 30	1,250.66

NOTE.--Elevations other than those shown are available.

RUM RIVER BASIN

05286000 RUM RIVER NEAR ST. FRANCIS, MN

LOCATION.--Lat 45°19'40", long 93°22'20", in SE¼ sec.19, T.33 N., R.24 W., Anoka County, Hydrologic Unit 07010207, on left bank at upstream side of highway bridge, 4 mi south of St. Francis and 15.8 mi upstream from mouth.

DRAINAGE AREA.--1,360 mi^2, approximately.

PERIOD OF RECORD.--May to November 1929, March 1930 to September 1931, April to November 1932, March 1933 to current year.

REVISED RECORDS.--WSP 1308: 1930(M), 1932(M).

GAGE.--Water-stage recorder. Datum of gage is 850.74 ft above National Geodetic Vertical Datum of 1929 (levels by Anoka County Highway Department). Prior to Nov. 9, 1933, nonrecording gage at site 50 ft downstream at same datum.

REMARKS.--Records good except those for Nov. 11, 14, 16, 19, 21, 24 and Dec. 4 to Mar. 5, which are fair. Occasional regulation by Ogechie (also controls Mille Lacs Lake) and Onamia Lakes.

AVERAGE DISCHARGE.--55 years (water years 1931, 1934-87), 639 ft^3/s, 6.38 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 10,100 ft^3/s, Apr. 20, 1965, Apr. 13, 1969; maximum gage height, 11.63 ft, Apr. 13, 1969; minimum discharge, 29 ft^3/s, Aug. 18, 1934, gage height, 1.91 ft.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 4,710 ft^3/s, Oct. 1, gage height, 7.52 ft, occurred on recession following peak of Sept. 28, 1986; maximum independent peak discharge, 955 ft^3/s, Mar. 28, gage height, 3.82 ft; minimum discharge, 165 ft^3/s, Sept. 8, 9, 15, 16, gage height, 2.26 ft.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	4480	1170	926	e720	e620	e560	885	610	688	276	223	199
2	3900	1150	924	e710	e630	e560	844	616	641	270	216	190
3	3560	1130	913	e710	e625	e560	809	616	599	264	228	182
4	3190	1110	e910	e700	e640	e580	767	612	562	255	217	179
5	2840	1090	e900	e700	e635	e610	759	604	534	255	205	175
6	2520	1090	e890	e695	e630	697	735	594	506	262	204	178
7	2260	1080	e885	e690	e625	769	731	580	488	257	210	171
8	2070	1070	e880	e685	e620	863	710	564	476	244	204	168
9	1920	1110	e880	e680	e615	872	703	563	454	237	206	166
10	1780	1110	e875	e675	e610	875	706	546	443	248	194	172
11	1700	e1100	e870	e670	e605	845	706	528	437	248	188	170
12	1660	1060	e860	e670	e600	856	707	506	429	250	215	174
13	1620	869	e850	e670	e595	827	712	493	417	246	229	174
14	1590	e900	e840	e665	e590	798	716	493	410	236	225	169
15	1570	919	e830	e665	e585	767	712	481	395	231	264	166
16	1550	e950	e820	e660	e580	742	713	467	381	222	324	166
17	1530	999	e810	e655	e580	733	719	465	376	219	326	203
18	1480	1040	e805	e655	e580	731	726	455	368	217	318	243
19	1460	e1000	e800	e650	e580	729	720	458	357	213	321	239
20	1420	977	e800	e650	e580	734	714	456	352	208	314	235
21	1390	e940	e790	e645	e580	743	708	473	345	237	299	229
22	1350	912	e780	e640	e580	752	696	502	338	242	281	233
23	1320	912	e770	e635	e580	780	687	525	332	262	263	243
24	1300	e912	e765	e630	e580	819	682	603	322	277	249	249
25	1270	912	e760	e625	e577	857	673	773	312	274	250	245
26	1240	948	e750	e620	e580	896	661	888	302	283	243	235
27	1230	1010	e745	e620	e580	926	653	923	293	269	236	222
28	1210	934	e740	e620	e580	947	631	896	294	263	227	209
29	1200	948	e735	e615	---	950	622	840	292	264	218	200
30	1190	934	e730	e610	---	940	607	793	283	248	220	186
31	1180	---	e725	e615	---	915	---	743	---	233	208	---
TOTAL	58080	30260	25573	20458	16772	24293	21419	18066	12424	7709	7525	5588
MEAN	1874	1010	825	660	599	784	714	602	414	249	243	199
MAX	4480	1170	926	720	640	950	885	923	688	283	326	249
MIN	1180	869	725	610	577	560	607	455	283	208	188	166
AC-FT	115200	60070	50720	40580	33270	48190	42480	37020	24640	15290	14930	11840
CFSM	1.38	.74	.61	.49	.44	.58	.52	.44	.30	.18	.18	.15
IN	1.59	.83	.70	.56	.46	.65	.59	.51	.34	.21	.21	.16

CAL YR 1986 TOTAL 586043 MEAN 1613 MAX 6530 MIN 350 AC-FT 1166000 CFSM 1.18 IN. 16.09
WTR YR 1987 TOTAL 249173 MEAN 683 MAX 4480 MIN 166 AC-FT 494200 CFSM .50 IN. 6.82

e Estimated

ELM CREEK BASIN

05287890 ELM CREEK NEAR CHAMPLIN, MN

LOCATION.--Lat 45°09'48", long 93°26'11", in NE¼NW¼ sec.35, T.120 N., R.22 W., Hennepin County, Hydrologic Unit 07010206, on left bank, 33 ft downstream from bridge on Elm Creek Road, 2.5 mi southwest of Champlin.

DRAINAGE AREA.--84.9 mi^2.

PERIOD OF RECORD.--October 1978 to current year.

GAGE.--Water-stage recorder. Datum of gage is 850.71 ft above National Geodetic Vertical Datum of 1929. Prior to March 15, 1979, nonrecording gage at present site and datum.

REMARKS.--Records good.

AVERAGE DISCHARGE.--9 years, 36.0 ft^3/s, 5.76 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 597 ft^3/s, Mar. 27, 1986, gage height, 9.93 ft; minimum 0.91 ft^3/s, July 2, 3, 1987, gage height, 3.23 ft.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 185 ft^3/s, Aug. 1 gage height, 7.49 ft; minimum discharge, 0.91 ft^3/s, July 2, 3, gage height, 3.23 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	115	17	12	5.8	4.6	5.1	6.7	4.1	3.2	1.2	181	4.8
2	101	18	12	5.5	4.6	5.1	6.1	4.7	2.4	1.2	173	4.1
3	92	19	e12	5.5	4.6	4.9	5.8	4.7	2.3	1.1	160	4.3
4	79	19	e11	5.5	4.4	5.0	5.6	4.6	2.3	1.2	142	4.7
5	70	19	e11	5.7	4.4	5.3	5.3	4.3	2.4	1.5	122	4.2
6	61	18	e10	5.8	4.4	6.6	5.3	4.2	2.3	2.1	105	3.6
7	54	18	10	5.5	4.5	8.9	5.4	4.0	2.2	2.7	89	3.4
8	48	21	10	5.5	4.7	7.9	5.7	3.7	2.2	3.8	78	2.8
9	43	20	e9.6	5.5	4.6	6.4	5.8	3.5	2.0	3.3	77	2.4
10	39	19	e9.0	5.4	4.6	6.2	5.7	3.8	2.2	3.8	66	2.3
11	38	e19	8.2	5.3	4.4	6.1	5.7	3.3	2.6	4.2	58	2.3
12	40	e18	7.8	5.4	4.5	5.6	5.7	3.1	2.4	4.7	54	2.6
13	39	17	7.9	5.5	4.6	5.6	5.6	3.0	2.1	5.2	49	2.8
14	40	17	7.9	5.3	4.6	5.7	5.6	4.6	2.0	3.9	43	2.4
15	40	17	7.3	4.9	4.5	5.4	5.3	5.0	1.6	3.4	38	2.2
16	41	16	7.1	5.0	4.5	4.8	5.3	4.7	1.5	3.6	42	2.2
17	40	16	6.7	4.8	4.4	4.8	5.9	4.1	1.7	2.8	41	2.8
18	39	16	6.7	4.9	4.3	4.6	6.1	4.7	1.8	2.4	38	3.3
19	37	e16	6.6	5.0	4.3	8.6	5.6	11	1.6	2.2	33	3.5
20	34	15	6.2	4.9	4.2	5.2	5.8	8.7	1.6	2.0	29	4.1
21	33	e14	6.0	4.8	4.1	4.5	5.3	7.7	1.6	2.5	26	4.0
22	32	14	6.0	4.7	4.3	4.2	4.9	6.8	1.5	2.4	24	3.5
23	30	14	5.9	4.7	4.2	4.5	4.6	6.4	1.4	2.4	19	3.3
24	29	13	6.1	e4.7	4.4	5.2	4.3	5.7	1.3	10	15	3.5
25	29	13	6.4	e4.6	4.6	5.4	4.0	5.6	1.4	22	12	3.4
26	28	13	6.2	e4.4	4.8	5.8	4.5	5.6	1.6	29	11	3.6
27	27	12	5.9	e4.3	5.1	7.9	4.4	4.7	1.6	52	10	3.8
28	25	12	5.8	4.1	5.0	6.7	4.5	5.0	1.2	91	8.9	3.7
29	21	12	6.2	4.3	---	6.1	4.7	4.4	1.4	128	8.4	3.8
30	19	12	5.9	4.0	---	6.5	4.2	4.2	1.2	154	7.6	4.0
31	17	---	5.9	4.5	---	6.7	---	3.6	---	174	6.1	---
TOTAL	1378	484	245.3	156.4	126.2	181.3	159.4	153.5	56.7	723.6	1766.0	101.4
MEAN	44.5	16.1	7.91	5.05	4.51	5.85	5.31	4.95	1.89	23.3	57.0	3.38
MAX	115	21	12	5.8	5.1	8.9	6.7	11	3.2	174	181	4.8
MIN	17	12	5.8	4.1	4.1	4.2	4.0	3.0	1.2	1.1	6.1	2.2
AC-FT	2730	960	487	310	250	360	316	304	112	1440	3500	201
CFSM	.52	.19	.09	.06	.05	.07	.06	.06	.02	.27	.67	.04
IN.	.60	.21	.11	.07	.06	.08	.07	.07	.02	.32	.77	.04

CAL YR 1986 TOTAL 20995.9 MEAN 57.5 MAX 545 MIN 5.0 AC-FT 41650 CFSM .68 IN. 9.20
WTR YR 1987 TOTAL 5531.8 MEAN 15.2 MAX 181 MIN 1.1 AC-FT 10970 CFSM .18 IN. 2.42

e Estimated

MISSISSIPPI RIVER MAIN STEM

05288500 MISSISSIPPI RIVER NEAR ANOKA, MN

LOCATION.--Lat 45°07'36", long 93°17'48", in SW¼ sec.12, T.119 N., R.21 W., Hennepin County, Hydrologic Unit 07010206, on right bank 0.4 mi downstream from Coon Creek, 1.3 mi downstream from Coon Rapids dam at Coon Rapids, 6.5 mi downstream from Anoka, and at mile 864.8 upstream from Ohio River.

DRAINAGE AREA.--19,100 mi^2, approximately.

WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--June 1931 to current year. Prior to October 1931 published as "at Coon Rapids, near Anoka."

GAGE.--Water-stage recorder. Datum of gage is 804.53 ft above National Geodetic Vertical Datum of 1929. Prior to June 14, 1932, at site 1.2 mi upstream at different datum.

REMARKS.--No estimated daily discharges. Records good. Flow slightly regulated by six reservoirs on headwaters; total usable capacity, 1,640,600 acre-ft. Diurnal regulation caused by dam above station.

AVERAGE DISCHARGE.--56 years, 3,026 ft^3/s, 5.71 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 91,000 ft^3/s, Apr. 17, 1965, gage height, 19.53 ft; minimum, 529 ft^3/s, Aug. 29, 1976, gage height, 0.04 ft, result of regulation; minimum daily, 602 cfs, Sept. 10, 1934.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 38,500 ft^3/s, Oct. 1, gage height, 11.01 ft, was not independent of peak discharge that occurred Sept. 26, 1986; maximum independent peak discharge, 15,700 ft^3/s, May 31, gage height, 6.03 ft; minimum discharge, 2,150 ft^3/s, Sept. 15, gage height, 1.40 ft.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	37300	13600	11200	8020	e7080	7050	12100	5350	14700	3920	7380	3720
2	35700	13200	11500	7820	e7380	6890	12200	5620	14500	3610	7430	3660
3	33700	12600	11400	6100	e8040	6690	11100	5690	13400	3810	7360	2930
4	31500	12900	10400	8090	e6920	6820	10800	5460	13200	3540	6860	3010
5	30000	12100	9100	7710	e7380	6810	9850	5000	11700	3450	6850	3110
6	27300	12200	9640	7820	e7300	7240	10300	5000	11900	3180	6210	3670
7	26100	12200	9340	7760	6830	7460	9900	5030	10000	3140	6040	3250
8	25000	12200	10100	7550	6680	8260	9520	4750	9440	3110	5820	3210
9	23900	12100	9380	7430	6520	8670	9680	4660	9010	2980	5940	3260
10	22700	12400	e7570	7950	6750	8270	9410	4300	8240	3160	5260	3350
11	22000	12200	e8090	7500	6940	8400	9250	4400	7760	3110	4680	2930
12	21300	10400	e7460	8020	6710	8550	9020	4570	7600	3360	4760	3250
13	21100	e9000	e5330	7660	6900	8530	9120	3860	7430	3070	5090	2820
14	20200	e8380	e5850	7500	7060	8450	9020	3730	7030	3210	5080	2950
15	19600	e10500	e9380	7330	6250	8310	8810	3870	6400	3180	4220	2950
16	19200	e9900	e10500	7040	7030	7980	8580	3970	6060	3200	5430	2890
17	18500	e11600	e10600	e8310	7140	7570	8750	3860	6010	3100	5010	3110
18	18500	11300	e9950	e7250	6980	7490	8310	3570	5520	2650	4700	3690
19	18000	10500	e10500	e7620	6620	7680	8150	4210	5280	2960	4460	3340
20	18100	11000	e9850	e7320	6740	7510	7860	4240	5230	2960	4690	3960
21	17300	10400	e9620	e7320	6700	7290	7890	4590	4910	3750	5050	4400
22	16900	11400	e9680	e7300	6770	7570	7350	5890	4220	3450	4360	4330
23	16500	11200	e9730	e4790	6650	8560	7170	7530	4520	4310	4300	4620
24	16000	11300	e9540	e4980	6620	9310	6810	10000	4860	4990	3920	4020
25	15500	11000	e9390	e5920	6690	10400	6450	11300	4110	5650	3880	4380
26	15200	11400	8960	e6110	6680	12200	6580	13100	4110	6070	4240	4850
27	14700	11200	8510	e6890	6760	13200	6180	14200	3950	6660	4140	4060
28	14900	11200	8320	e8050	6920	13300	5980	14900	3880	6300	4040	4090
29	14300	11400	8740	e7530	---	13400	5630	15100	4200	6510	3800	4790
30	14100	11300	8170	e7580	---	12900	5120	15300	4040	6780	3820	4670
31	13800	---	8230	e6990	---	12900	---	15200	---	6880	3640	---
TOTAL	658900	342050	286730	225300	193040	275660	256890	218250	223220	126070	158460	109120
MEAN	21250	11400	9249	7268	6894	8892	8563	7040	7441	4067	5112	3637
MAX	37300	13600	11500	8100	8040	13400	12200	15300	14700	6880	7430	4790
MIN	13800	8380	5330	4790	6250	6690	5120	3570	3880	2650	3640	2820
AC-FT	1307000	678500	568700	446900	382900	546800	509500	432900	442800	250100	314300	216400
CFSM	1.11	.60	.48	.38	.36	.47	.45	.37	.39	.21	.27	.19
IN.	1.28	.67	.56	.44	.38	.54	.50	.43	.43	.25	.31	.21

CAL YR 1986 TOTAL 6612020 MEAN 18120 MAX 50100 MIN 5330 AC-FT 13110000 CFSM .95 IN. 12.88
WTR YR 1987 TOTAL 3073720 MEAN 8421 MAX 37300 MIN 2650 AC-FT 6097000 CFSM .44 IN. 5.99

e Estimated

05288500 MISSISSIPPI RIVER NEAR ANOKA, MN--Continued

WATER-QUALITY RECORDS

LOCATION.--Sediment samples collected at Camden Avenue bridge, in Minneapolis, 7.0 mi downstream from gage. Tritium samples collected at gage near right bank. Prior to October 1, 1978, sediment samples collected at Lowry Avenue bridge.

DRAINAGE AREA.--19,600 mi^2 (50,800 km^2), approximately.

PERIOD OF RECORD.--Water years 1963-67, 1975 to current year.

PERIOD OF DAILY RECORD.--
WATER TEMPERATURES: October 1975 to current year.
SUSPENDED SEDIMENT DISCHARGE: August 1975 to current year.

REMARKS.--During the winter period, daily suspended-sediment load was estimated on the basis of water records and monthly sediment samples. Water temperature was obtained once-daily for most of the open water period and occasionally for the winter period.

EXTREMES FOR PERIOD OF DAILY RECORD.--
WATER TEMPERATURES (water years 1976-77, 1979-80, 1982-87): Maximum daily, 31.0°C, Aug. 25, 26, 1976, July 19, 1977, July 30 to Aug. 2, 1987; minimum daily, 0.0°C several days during winter period.
SEDIMENT CONCENTRATIONS: Maximum daily mean, 210 mg/L, Apr. 3, 1982; minimum daily mean, 1 mg/L on several days in 1978, 1980, 1981, 1982, and 1984.
SEDIMENT LOADS: Maximum daily, 17,400 tons, Apr. 20, 1982; minimum daily, 3.9 tons, Feb. 2, 1981.

EXTREMES FOR CURRENT YEAR.--
WATER TEMPERATURES: Maximum daily, 31.0°C, July 30 to Aug. 2; minimum daily observed, 1.0°C Jan. 1, 2, Feb. 14, 15.
SEDIMENT CONCENTRATION: Maximum daily mean, 100 mg/L, July 21, minimum daily mean, 2 mg/L, Jan. 6 to 17.
SEDIMENT LOADS: Maximum daily, 2,480 tons, May 30; minimum daily, 34 tons, Jan. 17.

WATER TEMPERATURE, DEGREES CENTIGRADE, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	17.0	7.0	1.5	---	---	---	4.0	---	24.0	25.0	31.0	21.5
2	15.0	7.0	---	1.0	---	3.0	5.0	---	23.0	26.0	31.0	23.0
3	14.0	7.0	---	1.0	---	4.0	7.0	17.0	21.0	24.0	29.0	22.0
4	12.0	6.0	---	2.0	---	6.0	7.0	18.0	22.0	25.0	26.0	24.0
5	13.0	7.0	---	---	---	6.0	9.0	19.0	23.0	25.0	26.0	22.0
6	13.0	8.0	---	2.0	---	8.0	12.0	20.0	24.0	27.0	26.0	23.0
7	14.0	8.0	---	---	---	9.0	13.0	20.0	26.0	28.0	26.0	22.0
8	13.0	---	---	2.0	---	7.0	14.0	22.0	24.0	29.0	25.0	22.0
9	13.0	---	---	---	---	3.0	14.0	20.0	24.0	29.0	26.0	22.0
10	12.0	---	---	---	---	2.0	14.0	19.0	20.0	29.0	28.0	21.0
11	10.0	---	---	---	---	3.0	13.0	22.0	23.0	25.0	---	21.0
12	9.0	---	---	---	---	4.0	16.0	22.0	26.0	26.0	25.0	18.0
13	6.0	---	---	---	4.0	4.0	14.0	22.0	27.0	25.0	25.0	19.0
14	9.0	---	---	2.0	1.0	5.0	14.0	21.0	28.0	25.0	24.0	19.0
15	9.0	---	---	---	1.0	5.0	14.0	22.0	26.0	25.0	25.0	21.0
16	---	---	---	---	---	5.0	16.0	24.0	---	26.0	26.0	18.0
17	---	---	---	---	2.0	5.0	15.0	26.0	26.0	27.0	26.0	19.0
18	9.0	---	---	---	2.0	4.0	16.0	19.0	29.0	---	25.0	19.0
19	11.0	---	---	---	3.0	5.0	20.0	19.0	28.0	29.0	26.0	18.0
20	10.0	---	---	---	4.0	9.0	17.0	20.0	25.0	---	26.0	18.0
21	12.0	---	---	---	---	7.0	15.0	20.0	27.0	30.0	25.0	18.0
22	13.0	---	---	---	---	9.0	14.0	17.0	29.0	30.0	23.0	19.0
23	12.0	---	---	---	---	8.0	16.0	16.0	---	28.0	19.0	22.0
24	11.0	---	---	---	---	9.0	16.0	18.0	---	28.0	23.0	20.0
25	10.0	---	---	---	---	8.0	14.0	17.0	---	29.0	22.0	20.0
26	11.0	---	---	---	3.5	7.0	20.0	19.0	---	29.0	20.0	---
27	12.0	---	---	---	---	8.0	17.0	21.0	---	29.0	20.0	20.0
28	12.0	3.0	---	---	---	7.0	19.0	21.0	---	29.0	22.0	21.0
29	11.0	---	---	---	---	5.0	19.0	22.0	24.0	30.0	20.0	20.0
30	10.0	---	---	---	---	4.0	18.0	22.0	25.0	31.0	---	19.0
31	9.0	---	---	---	---	5.0	---	23.0	---	31.0	---	---
MEAN	---	---	---	---	---	---	14.1	---	---	---	---	---
MAX	---	---	---	---	---	---	20.0	---	---	---	---	---
MIN	---	---	---	---	---	---	4.0	---	---	---	---	---

05288500 MISSISSIPPI RIVER NEAR ANOKA, MN--Continued

SEDIMENT, SUSPENDED CONCENTRATION (MG/L), WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DAY	MEAN CONCENTRATION (MG/L)	LOAD (TONS/DAY)	MEAN CONCENTRATION (MG/L)	LOAD (TONS/DAY)	MEAN CONCENTRATION (MG/L)	LOAD (TONS/DAY)	MEAN CONCENTRATION (MG/L)	LOAD (TONS/DAY)	MEAN CONCENTRATION (MG/L)	LOAD (TONS/DAY)	MEAN CONCENTRATION (MG/L)	LOAD (TONS/DAY)
	OCTOBER		NOVEMBER		DECEMBER		JANUARY		FEBRUARY		MARCH	
1	20	2010	9	330	6	181	4	87	5	96	5	95
2	18	1740	7	249	6	186	4	84	5	100	5	93
3	16	1460	6	204	6	185	4	87	5	109	3	54
4	15	1280	8	279	6	168	4	87	5	93	4	74
5	12	972	6	196	6	147	3	62	5	100	4	74
6	9	663	6	198	6	156	2	42	6	118	4	78
7	10	705	7	231	6	151	2	42	6	111	4	81
8	12	810	7	231	6	164	2	41	5	108	8	178
9	9	581	7	229	6	152	2	40	6	106	8	187
10	10	613	7	234	6	123	2	43	6	109	5	112
11	10	594	7	231	6	131	2	40	6	112	5	113
12	8	460	7	197	6	121	2	43	6	109	5	115
13	9	513	7	170	6	86	2	41	6	112	4	92
14	9	491	7	158	6	95	2	40	6	114	4	91
15	10	529	7	198	6	152	2	40	6	101	4	90
16	11	570	7	187	5	142	2	38	6	114	5	108
17	10	499	7	219	5	143	2	34	6	116	6	123
18	8	400	7	214	5	134	3	59	5	94	7	142
19	6	292	7	198	5	142	3	62	4	71	8	166
20	8	391	7	208	5	133	3	59	7	127	7	142
21	8	374	7	197	5	130	3	59	8	145	9	177
22	12	548	7	215	5	131	3	59	8	146	7	143
23	15	668	6	181	5	131	4	52	8	144	8	185
24	14	605	6	183	5	130	4	54	8	143	10	251
25	12	486	6	178	5	135	4	64	8	145	16	449
26	8	328	5	154	5	121	4	66	8	144	22	725
27	8	318	5	151	5	115	4	74	7	128	26	927
28	9	362	5	151	5	112	5	109	6	112	20	718
29	10	386	5	154	4	94	5	102	---	---	15	543
30	10	381	6	183	4	88	5	102	---	---	15	522
31	10	373	---	---	4	89	5	94	---	---	12	418
TOTAL	---	20402	---	6108	---	4168	---	1906	---	3227	---	7266
YEAR		109468										

DAY	MEAN CONCENTRATION (MG/L)	LOAD (TONS/DAY)	MEAN CONCENTRATION (MG/L)	LOAD (TONS/DAY)	MEAN CONCENTRATION (MG/L)	LOAD (TONS/DAY)	MEAN CONCENTRATION (MG/L)	LOAD (TONS/DAY)	MEAN CONCENTRATION (MG/L)	LOAD (TONS/DAY)	MEAN CONCENTRATION (MG/L)	LOAD (TONS/DAY)
	APRIL		MAY		JUNE		JULY		AUGUST		SEPTEMBER	
1	11	359	8	116	60	2380	15	159	34	677	14	141
2	11	362	7	106	56	2190	14	136	26	522	14	138
3	10	300	6	92	51	1850	13	134	22	437	12	95
4	10	292	7	103	47	1680	14	134	30	556	12	98
5	10	266	8	108	42	1330	14	130	35	647	12	101
6	9	250	7	94	38	1220	14	120	28	469	14	139
7	9	241	9	122	33	891	14	119	20	326	13	114
8	10	257	8	103	29	739	16	134	22	346	12	104
9	10	261	9	113	24	584	18	145	22	353	13	114
10	10	254	9	104	20	445	20	171	17	241	16	145
11	10	250	10	119	16	335	21	176	14	177	11	89
12	11	268	13	160	16	328	22	200	16	206	11	97
13	12	295	15	156	16	321	22	182	17	234	9	69
14	13	317	14	141	16	304	20	173	14	192	9	72
15	13	309	12	125	16	276	19	163	23	262	11	88
16	13	301	9	96	16	262	18	156	31	454	11	88
17	14	331	7	73	16	260	18	151	17	230	12	101
18	15	337	11	106	16	238	18	129	15	190	16	159
19	15	330	11	125	16	229	19	152	17	205	11	99
20	16	340	11	126	16	226	44	352	20	253	16	171
21	16	341	11	136	16	212	100	1010	18	245	13	154
22	16	318	12	191	16	182	56	522	17	200	13	152
23	16	310	18	366	16	195	45	524	18	209	13	162
24	16	294	24	648	16	210	38	512	18	191	12	130
25	15	261	30	915	16	178	66	1010	18	189	12	142
26	15	266	36	1270	16	178	56	918	19	218	11	136
27	15	250	42	1610	16	171	42	758	18	201	11	121
28	14	226	48	1930	16	168	28	476	17	185	11	121
29	11	167	54	2200	16	181	26	457	16	164	12	155
30	8	111	60	2480	15	175	36	659	15	155	12	151
31	---	---	60	2460	---	---	38	706	15	147	---	---
TOTAL	---	8464	---	16494	---	17938	---	10758	---	9081	---	3646
YEAR		109468										

MINNESOTA RIVER BASIN

05291000 WHETSTONE RIVER NEAR BIG STONE CITY, SD

LOCATION.--Lat 45°17'32", long 96°29'14", in SE¼NW¼ sec.18, T.121 N., R.46 W., Grant County, Hydrologic Unit 07020001, on right bank 20 ft downstream from former highway bridge site, 1.5 mi west of Big Stone City, and 4.5 mi upstream from Big Stone Lake.
DRAINAGE AREA.--389 mi^2.

WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--March 1910 to November 1912 (no winter records), and March 1931 to current year. Monthly discharge only for some periods, published in WSP 1308.
REVISED RECORDS.--WSP 895: Drainage area. WSP 1308: 1932(M), 1935(M).
GAGE.--Water-stage recorder. Datum of gage is 996.96 ft adjustment of 1912. Mar. 8, 1910, to Nov. 30, 1912, nonrecording gage 2 mi downstream at different datum. Mar. 18, 1931, to May 3, 1939, nonrecording gage, at site 20 ft upstream at present datum. May 4, 1939, to Nov. 8, 1952, water-stage recorder at site 80 ft downstream at present datum.
REMARKS.--Records good except those for Nov. 8 to Mar. 12, which are fair.
AVERAGE DISCHARGE.--56 years (water years 1932-87), 50.4 ft^3/s, 1.76 in/yr, 36,510 acre-ft/yr; median of yearly mean discharges, 35 ft^3/s, 1.22 in/yr, 25,400 acre-ft/yr.
EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 6,870 ft^3/s, Apr. 8, 1969, gage height, 14.32 ft from floodmark; no flow at times in most years.
EXTREMES OUTSIDE PERIOD OF RECORD.--Maximum stage known, about 26 ft in June 1919, present site and datum, from information by local resident, discharge 29,000 ft^3/s.
EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 200 ft^3/s and maximum (*):

Date	Time	Discharge (ft^3/s)	Gage height (ft)	Date	Time	Discharge (ft^3/s)	Gage height (ft)
Mar. 6	--	Ice jam	*4.23	Mar. 26	1745	*294	4.08
Mar. 21	1930	244	3.83				

Minimum, 0.61 ft^3/s, Sept. 28, gage height, 1.81 ft; minimum gage height, 1.03 ft, July 1.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	76	38	e31	e26	e15	e16	104	31	40	2.0	2.9	4.0
2	71	37	e31	e26	e15	e16	104	27	25	2.7	3.7	3.7
3	67	37	e31	e25	e15	e17	95	27	20	2.4	1.5	3.9
4	65	37	e31	e25	e16	e24	86	33	17	3.2	2.1	3.3
5	103	38	e31	e25	e17	e29	83	29	14	11	6.0	4.2
6	76	36	e31	e25	e17	e68	81	27	12	14	8.6	5.2
7	66	36	e30	e25	e18	e161	81	24	9.9	11	12	4.8
8	60	e38	e30	e25	e18	e119	81	21	8.5	8.3	14	2.7
9	54	e26	e30	e24	e18	e67	81	19	7.7	7.0	16	1.7
10	50	e29	e29	e24	e18	e74	81	19	7.4	7.2	17	2.0
11	50	e29	e28	e24	e18	e66	81	17	9.9	11	14	2.3
12	99	e29	e27	e24	e18	e53	78	15	8.0	10	12	4.2
13	59	e29	e26	e23	e18	55	78	19	7.4	8.9	12	4.7
14	51	e29	e25	e23	e18	53	79	18	6.4	11	12	4.4
15	48	e29	e24	e21	e17	54	77	14	5.8	9.4	12	4.5
16	46	e30	e24	e20	e17	48	78	12	5.0	7.2	10	5.1
17	47	e30	e25	e20	e17	45	75	13	4.6	5.8	11	10
18	44	e29	e25	e20	e16	47	71	12	6.5	5.1	12	9.0
19	41	e29	e25	e19	e16	55	64	12	5.0	5.7	9.4	6.5
20	40	e29	e25	e19	e16	69	67	13	4.3	5.7	3.3	5.8
21	41	e29	e26	e19	e16	163	63	15	3.9	5.9	2.6	5.4
22	42	e29	e26	e18	e16	208	66	15	3.4	4.1	2.8	5.5
23	41	e29	e26	e16	e16	161	65	16	2.6	3.5	3.0	6.3
24	41	e29	e26	e15	e16	181	59	17	2.7	2.8	3.0	5.2
25	41	e30	e26	e15	e16	254	55	19	3.3	3.8	3.0	4.6
26	42	e31	e26	e15	e16	277	53	19	2.8	4.2	2.7	2.6
27	43	e31	e26	e15	e16	264	46	23	2.3	4.2	4.5	1.8
28	43	e31	e26	e15	e16	186	43	23	4.0	2.4	6.5	1.1
29	41	e31	e26	e15	---	103	40	21	3.3	6.9	5.4	2.0
30	41	e31	e26	e15	---	114	37	59	2.5	5.8	4.4	1.8
31	40	---	e26	e15	---	117	---	49	---	6.3	4.8	---
TOTAL	1669	945	845	636	466	3164	2152	678	256.2	198.5	234.2	128.3
MEAN	53.8	31.5	27.3	20.5	16.6	102	71.7	21.9	8.54	6.40	7.55	4.28
MAX	103	38	31	26	18	277	104	59	40	14	17	10
MIN	40	26	24	15	15	16	37	12	2.3	2.0	1.5	1.1
AC-FT	3310	1870	1680	1260	924	6280	4270	1340	508	394	465	254
CFSM	.14	.08	.07	.05	.04	.26	.18	.06	.02	.02	.02	.01
IN.	.16	.09	.08	.06	.04	.30	.21	.06	.02	.02	.02	.01

CAL YR 1986 TOTAL 68730.9 MEAN 188 MAX 3800 MIN 9.3 AC-FT 136300 CFSM .48 IN 6.57
WTR YR 1987 TOTAL 11372.2 MEAN 31.2 MAX 277 MIN 1.1 AC-FT 22560 CFSM .08 IN. 1.09

e Estimated

05291000 WHETSTONE RIVER NEAR BIG STONE CITY, SD--Continued

WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1960-62, 1967 to 69, 1974 to current year.

PERIOD OF DAILY RECORD.--
WATER TEMPERATURES: October 1973 to September 1981, March to August each year, 1982 to current year.
SUSPENDED-SEDIMENT DISCHARGE: October 1973 to September 1981, March to August each year, 1982 to current year.

REMARKS.--Daily sediment concentrations were estimated on the basis of water records and daily sediment samples. Water temperature was obtained when sediment samples were collected.

EXTREMES FOR PERIOD OF DAILY RECORD.--
WATER TEMPERATURES: Maximum daily, 37.0°C July 28, 1987; minimum daily, 0.0°C many days during winter period.
SEDIMENT CONCENTRATIONS: Maximum daily mean, 2,540 mg/L, Mar. 27, 1979; minimum daily mean, 0 mg/L, July 30, 31, Aug. 1-7, 24-26, 1976.
SEDIMENT LOADS: Maximum daily, 5,700 tons, Mar. 31, 1982; minimum daily, 0 ton, July 30, 31, Aug. 1-7, 24-26, 1976.

EXTREMES FOR CURRENT PERIOD.--March to August 1987:
WATER TEMPERATURES: Maximum daily, 37.0°C, July 28; minimum daily, 0.0°C, many days during winter period.
SEDIMENT CONCENTRATIONS: Maximum daily mean, 170 mg/L, Mar. 21, minimum daily mean, 8 mg/L, Aug. 18, 19.
SEDIMENT LOADS: Maximum daily, 125 tons, Mar. 26; minimum daily, 0.09 ton, July 25.

WATER TEMPERATURE, DEGREES CENTIGRADE, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987
INSTANTANEOUS VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	---	---	---	---	---	---	5.0	22.0	26.0	27.0	34.0	---
2	---	---	---	---	---	---	8.0	18.0	23.0	27.0	35.0	---
3	---	---	---	---	---	---	11.0	18.0	24.0	29.0	33.0	---
4	---	---	---	---	---	---	13.0	17.0	26.0	24.0	30.0	---
5	---	---	---	---	---	---	11.0	17.5	28.0	24.0	30.0	---
6	---	---	---	---	---	---	15.0	20.0	32.0	29.0	29.0	---
7	---	---	---	---	---	---	19.0	23.0	28.0	31.0	25.0	---
8	---	---	---	---	---	---	19.0	24.0	26.5	30.0	---	---
9	---	---	---	---	---	---	14.0	27.0	22.0	33.0	---	---
10	---	---	---	---	---	---	14.0	27.0	19.0	33.0	---	---
11	---	---	---	---	---	---	16.0	22.0	29.0	28.0	29.0	---
12	---	---	---	---	---	---	15.0	20.5	30.0	25.0	28.0	---
13	---	---	---	---	---	3.0	13.0	20.5	24.0	26.0	30.0	---
14	---	---	---	---	---	5.0	15.0	25.0	25.0	26.0	28.0	---
15	---	---	1.5	---	---	5.0	17.0	20.5	32.0	30.0	32.0	---
16	---	---	---	---	---	5.0	18.0	25.5	26.0	32.0	29.0	---
17	---	---	---	---	---	5.0	22.0	27.0	29.0	31.0	28.0	---
18	---	---	---	---	---	5.0	23.0	17.5	30.0	30.0	27.0	20.0
19	---	---	---	---	---	8.0	23.0	20.0	---	25.0	29.0	---
20	---	---	---	---	---	6.0	16.0	22.5	33.0	32.0	29.0	---
21	---	---	---	---	---	10.0	17.0	15.0	33.0	33.0	26.0	---
22	13.5	---	---	---	---	6.0	18.0	13.0	33.0	34.0	26.0	---
23	---	---	---	---	---	6.0	20.0	19.0	32.0	34.0	25.0	---
24	---	---	---	---	---	6.0	16.0	18.0	26.0	35.0	24.0	---
25	---	---	---	---	---	6.0	15.0	24.5	29.0	28.0	18.0	---
26	---	---	---	---	---	6.0	22.0	20.0	27.0	27.0	20.0	---
27	---	---	---	---	---	8.0	19.0	23.0	27.5	36.0	18.0	---
28	---	---	---	---	---	---	22.0	26.0	29.0	37.0	25.0	---
29	---	---	---	---	---	2.0	21.0	26.0	28.0	35.0	21.0	---
30	---	---	---	0.0	---	4.0	19.0	27.0	27.0	---	21.0	---
31	---	---	---	---	---	8.0	---	26.0	---	35.0	24.0	---
MEAN	---	---	---	---	---	---	16.5	21.7	---	---	---	---
MAX	---	---	---	---	---	---	23.0	27.0	---	---	---	---
MIN	---	---	---	---	---	---	5.0	13.0	---	---	---	---

MINNESOTA RIVER BASIN

05291000 WHETSTONE RIVER NEAR BIG STONE CITY, SD.--Continued

SEDIMENT, SUSPENDED CONCENTRATION (MG/L), WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DAY	MEAN CONCEN-TRATION (MG/L)	LOAD (TONS/ DAY)	MEAN CONCEN-TRATION (MG/L)	LOAD (TONS/ DAY)	MEAN CONCEN-TRATION (MG/L)	LOAD (TONS/ DAY)	MEAN CONCEN-TRATION (MG/L)	LOAD (TONS/ DAY)	MEAN CONCEN-TRATION (MG/L)	LOAD (TONS/ DAY)	MEAN CONCEN-TRATION (MG/L)	LOAD (TONS/ DAY)
	OCTOBER		NOVEMBER		DECEMBER		JANUARY		FEBRUARY		MARCH	
1	---	---	---	---	---	---	---	---	---	---	35	1.5
2	---	---	---	---	---	---	---	---	---	---	35	1.5
3	---	---	---	---	---	---	---	---	---	---	35	1.6
4	---	---	---	---	---	---	---	---	---	---	35	2.3
5	---	---	---	---	---	---	---	---	---	---	35	2.7
6	---	---	---	---	---	---	---	---	---	---	35	6.4
7	---	---	---	---	---	---	---	---	---	---	35	15
8	---	---	---	---	---	---	---	---	---	---	35	11
9	---	---	---	---	---	---	---	---	---	---	35	6.3
10	---	---	---	---	---	---	---	---	---	---	35	7.0
11	---	---	---	---	---	---	---	---	---	---	35	6.2
12	---	---	---	---	---	---	---	---	---	---	35	5.0
13	---	---	---	---	---	---	---	---	---	---	37	5.5
14	---	---	---	---	---	---	---	---	---	---	48	6.9
15	---	---	---	---	---	---	---	---	---	---	55	8.0
16	---	---	---	---	---	---	---	---	---	---	59	7.7
17	---	---	---	---	---	---	---	---	---	---	58	7.0
18	---	---	---	---	---	---	---	---	---	---	59	7.4
19	---	---	---	---	---	---	---	---	---	---	79	12
20	---	---	---	---	---	---	---	---	---	---	112	21
21	---	---	---	---	---	---	---	---	---	---	170	75
22	---	---	---	---	---	---	---	---	---	---	116	65
23	---	---	---	---	---	---	---	---	---	---	43	19
24	---	---	---	---	---	---	---	---	---	---	35	17
25	---	---	---	---	---	---	---	---	---	---	131	90
26	---	---	---	---	---	---	---	---	---	---	167	125
27	---	---	---	---	---	---	---	---	---	---	117	83
28	---	---	---	---	---	---	---	---	---	---	97	49
29	---	---	---	---	---	---	---	---	---	---	103	29
30	---	---	---	---	---	---	---	---	---	---	89	27
31	---	---	---	---	---	---	---	---	---	---	86	27
TOTAL	---	---	---	---	---	---	---	---	---	---	---	748.0

DAY	MEAN CONCEN-TRATION (MG/L)	LOAD (TONS/ DAY)	MEAN CONCEN-TRATION (MG/L)	LOAD (TONS/ DAY)	MEAN CONCEN-TRATION (MG/L)	LOAD (TONS/ DAY)	MEAN CONCEN-TRATION (MG/L)	LOAD (TONS/ DAY)	MEAN CONCEN-TRATION (MG/L)	LOAD (TONS/ DAY)	MEAN CONCEN-TRATION (MG/L)	LOAD (TONS/ DAY)
	APRIL		MAY		JUNE		JULY		AUGUST		SEPTEMBER	
1	76	21	87	7.4	16	1.7	57	.32	19	.15	---	---
2	79	22	46	3.4	16	1.1	85	.62	50	.50	---	---
3	70	18	93	6.7	13	.70	84	.54	57	.23	---	---
4	88	21	112	10	15	.69	65	.57	114	.65	---	---
5	88	20	62	4.8	28	1.0	55	1.6	50	.81	---	---
6	73	16	67	4.9	30	.95	60	2.3	11	.26	---	---
7	48	10	69	4.4	26	.70	57	1.8	11	.36	---	---
8	62	14	100	5.7	21	.48	73	1.6	86	3.3	---	---
9	77	17	107	5.6	29	.60	68	1.3	57	2.5	---	---
10	84	18	101	5.1	32	.64	60	1.2	14	.64	---	---
11	70	15	80	3.8	32	.85	49	1.4	11	.42	---	---
12	67	14	61	2.4	66	1.6	34	.96	12	.39	---	---
13	79	17	34	1.7	74	1.5	60	1.4	11	.36	---	---
14	70	15	30	1.5	52	.90	54	1.6	12	.39	---	---
15	73	15	61	2.3	48	.75	36	.91	10	.32	---	---
16	63	13	66	2.2	48	.65	24	.47	29	.78	---	---
17	50	10	70	2.4	47	.59	25	.39	26	.77	---	---
18	37	7.1	70	2.3	23	.40	17	.23	8	.26	---	---
19	57	9.9	110	3.7	16	.22	11	.17	8	.20	---	---
20	80	14	76	2.7	23	.26	11	.17	54	.48	---	---
21	99	17	76	3.0	27	.28	23	.36	45	.32	---	---
22	119	21	71	3.0	24	.22	35	.39	15	.11	---	---
23	91	16	62	2.7	37	.26	42	.40	20	.16	---	---
24	66	11	45	2.1	36	.26	14	.10	22	.18	---	---
25	61	9.0	47	2.4	35	.31	9	.09	48	.39	---	---
26	53	7.5	72	3.8	30	.22	16	.18	52	.38	---	---
27	86	11	62	3.9	37	.23	19	.21	65	.79	---	---
28	106	12	45	2.8	37	.40	80	.53	38	.67	---	---
29	100	11	21	1.7	34	.31	58	1.1	22	.32	---	---
30	97	9.6	77	12	35	.23	13	.20	48	.57	---	---
31	---	---	39	5.1	---	---	---	---	23	.30	---	---
TOTAL	---	432.1	---	125.5	---	19.00	---	---	---	17.96	---	---

MINNESOTA RIVER BASIN

05291500 BIG STONE LAKE AT ORTONVILLE, MN

LOCATION.--Lat 45°18'18", long 96°26'57", in NW¼SW¼ sec.9, T.121 N., R.46 W., Big Stone County, Hydrologic Unit 07020001, at powerplant intake at west edge of Ortonville, 0.5 mi north of concrete dam at outlet, 0.5 mi southwest of Ortonville.

PERIOD OF RECORD.--March 1937 to current year.

GAGE.--Nonrecording gage read once a day. Datum of gage is 957.69 ft above National Geodetic Vertical Datum of 1929. Prior to Sept. 17, 1947, nonrecording gage at site 0.5 mi south at same datum. Sept. 18, 1947, to June 30, 1963, water-stage recorder at site 0.5 mi south at same datum. Sept. 21, 1959, to June 30. 1963, supplementary nonrecording gage read once daily, at present site and datum.

REMARKS.--Natural lake with concrete dam at outlet. Dam was rebuilt and completed in Nov. 1985, with the following changes: Eight 7 ft high by 10 ft wide electrically operated slide gates, one 48 in. by 48 in. gate; and one 18 in. sluice gate; sills of all gates are at 3.0 ft. Silt barrier dam 700 ft upstream in outlet channel of lake completed July 7, 1958; rebuilt and completed Dec. 1986 with the new crest at 7.0 ft (previous crest was at 5.9 ft). Supplementary nonrecording gage readings used for stages below crest of silt barrier to June 30, 1963. Water level subject to fluctuation caused by wind action.

EXTREMES FOR PERIOD OF RECORD.--Maximum gage height, 12.73 ft, Apr. 17, 1952; minimum observed, 3.53 ft, Mar. 2, 1957 (strong upstream wind in channel). Minimum observations of 3.10 ft, Mar. 2, 1940, and 2.20 ft, Nov. 20, 1940, at spillway site are the result of blockage of channel to spillway by ice and snow and do not represent lake elevations.

EXTREMES FOR CURRENT YEAR.--Maximum gage height observed, 7.90 ft, Apr. 1; minimum observed, 6.20 ft, Sept. 3 (10 mph SSE wind blowing upstream in channel).

GAGE HEIGHT, IN FEET, OCTOBER 1986 TO SEPTEMBER 1987

Oct. 31	6.65	Feb. 28	7.28	June 30	6.85
Nov. 30	6.80	Mar. 31	7.62	July 31	6.80
Dec. 31	7.05	Apr. 30	7.40	Aug. 31	6.40
Jan. 31	7.15	May 31	7.20	Sept. 30	6.30

NOTE.--Gage-height record other than that shown above is available in the District office.

05292000 MINNESOTA RIVER AT ORTONVILLE, MN

LOCATION.--Lat 45°17'44", long 96°26'38", in NE¼NW¼ sec.16, T.121 N., R.46 W., Big Stone County, Hydrologic Unit 07020001, on left bank 400 ft downstream from bridge on U.S. Highway 12 and 1,300 ft downstream from dam at outlet of Big Stone Lake, at Ortonville.

DRAINAGE AREA.--1,160 mi^2, approximately.

PERIOD OF RECORD.--February 1938 to current year.

REVISED RECORDS.--WSP 895: 1939. WSP 1508: 1942 (yearly mean).

GAGE.--Water-stage recorder. Datum of gage is 956.38 ft above National Geodetic Vertical Datum of 1929. Prior to Mar. 31, 1939, nonrecording gage on downstream side of dam 1,300 ft upstream at datum 1.31 ft higher.

REMARKS.--Records good. Some regulation by Big Stone Lake (station 05291500).

AVERAGE DISCHARGE.--49 years, 111 ft^3/s, 80,420 acre-ft/yr; median of yearly mean discharges, 83 ft^3/s, 60,100 acre-ft/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 3,060 ft^3/s, Apr. 13, 1952, gage height, 12.92 ft; no flow Dec. 13, 1940.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 501 ft^3/s, Oct. 3, gage height, 6.22 ft; minimum, 1.1 ft^3/s, Aug. 24, 25, 26, 27, gage height, 1.17 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	406	34	18	12	34	72	250	96	27	5.3	2.8	2.8
2	443	34	18	12	32	84	243	97	55	3.1	2.8	2.7
3	464	34	18	12	32	106	199	92	73	3.0	2.8	2.5
4	458	38	26	12	34	117	148	95	41	3.4	2.3	2.4
5	454	38	17	12	35	138	159	93	24	3.4	2.3	2.6
6	304	31	18	13	36	143	177	92	21	3.3	1.9	2.3
7	253	21	17	16	37	184	176	86	21	3.3	1.9	2.4
8	288	36	17	16	38	187	175	80	23	3.1	1.9	2.5
9	292	27	16	16	39	200	143	78	21	4.4	2.1	2.4
10	228	27	17	16	40	174	114	76	15	4.9	2.2	2.4
11	208	26	17	17	41	194	114	72	16	4.7	2.3	2.3
12	209	27	17	16	43	183	113	52	20	3.9	2.3	2.2
13	200	27	17	16	45	167	113	30	19	3.7	2.2	2.2
14	170	27	17	17	46	159	112	27	19	3.8	2.2	2.2
15	135	27	14	17	47	144	124	25	9.8	4.0	2.1	2.2
16	134	27	14	e17	48	142	142	27	4.8	3.5	2.1	2.5
17	133	25	13	e17	49	135	142	28	5.5	3.7	2.0	2.9
18	132	23	13	e18	49	133	134	27	5.1	3.9	2.0	3.8
19	132	23	13	e18	50	153	132	27	4.3	3.9	2.0	3.8
20	97	21	13	e18	51	150	159	29	4.7	4.8	1.6	3.8
21	95	20	13	19	52	161	169	32	5.4	5.4	1.2	3.8
22	80	21	12	e19	54	193	155	31	5.0	4.3	1.3	3.4
23	61	22	12	e20	55	236	147	28	4.4	4.3	1.2	3.4
24	58	18	13	e21	56	297	106	24	4.4	4.4	1.2	3.4
25	58	14	13	e22	57	348	64	24	5.1	4.9	1.2	3.4
26	58	14	e13	e22	61	333	63	25	5.8	4.9	1.1	3.0
27	57	14	13	33	68	314	93	27	6.0	4.6	1.1	2.5
28	64	14	12	34	70	306	123	27	6.3	3.7	1.2	2.5
29	36	17	11	32	---	248	103	27	6.9	2.7	1.7	2.1
30	34	16	12	32	---	221	97	27	6.9	2.6	3.0	2.1
31	39	---	12	31	---	216	---	27	---	3.7	2.9	---
TOTAL	5780	743	466	593	1299	5838	4189	1529	485.4	122.6	60.9	82.5
MEAN	186	24.8	15.0	19.1	46.4	188	140	49.3	16.2	3.95	1.96	2.75
MAX	464	38	26	34	70	348	250	97	73	5.4	3.0	3.8
MIN	34	14	11	12	32	72	63	24	4.3	2.6	1.1	2.1
AC-FT	11460	1470	924	1180	2580	11580	8310	3030	963	243	121	164
CFSM	.16	.02	.01	.02	.04	.16	.12	.04	.01	.00	.00	.00
IN.	.19	.02	.01	.02	.04	.19	.13	.05	.02	.00	.00	.00

CAL YR 1986 TOTAL 139343.1 MEAN 382 MAX 2410 MIN 6.8 AC-FT 276400 CFSM .33 IN. 4.47
WTR YR 1987 TOTAL 21188.4 MEAN 58.1 MAX 464 MIN 1.1 AC-FT 42030 CFSM .05 IN. .68

e Estimated

MINNESOTA RIVER BASIN

05293000 YELLOW BANK RIVER NEAR ODESSA, MN

LOCATION.--Lat 45°13'35", long 96°21'12", in SE¼SE¼ sec.1, T.120 N., R.46 W., Lac qui Parle County, Hydrologic Unit 07020001, on left bank 150 ft downstream from highway bridge, 2.5 mi southwest of Odessa, and 4.5 mi upstream from mouth.

DRAINAGE AREA.--398 mi^2.

WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--October 1939 to current year.

REVISED RECORDS.--WSP 1388: 1947(M), 1950.

GAGE.--Water-stage recorder. Datum of gage is 953.34 ft above National Geodetic Vertical Datum of 1929 (U.S. Army Corps of Engineers bench mark). Prior to Aug. 28, 1940, nonrecording gage at site 150 ft upstream at same datum.

REMARKS.--Records good except those for Nov. 9 to 12, 15, Nov. 18 to Mar. 12, which are fair.

AVERAGE DISCHARGE.--48 years, 60.3 ft^3/s, 2.06 in/yr, 43,690 acre-ft/yr; median of yearly mean discharges, 48 ft^3/s, 1.64 in/yr, 34,800 acre-ft/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 6,970 ft^3/s, Apr. 9, 1969, gage height, 19.07 ft, from floodmark; no flow at times in several years.

EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge base of 300 ft^3/s and maximum (*):

Date	Time	Discharge (ft^3/s)	Gage height (ft)	Date	Time	Discharge (ft^3/s)	Gage height (ft)
Mar. 26	2045	*264	*4.42	No peak greater than base discharge.			

Minimum discharge, 1.1 ft^3/s, Sept. 4, gage height, 1.82 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	83	40	e42	e19	e17	e42	111	38	20	4.0	2.2	1.4
2	76	40	e41	e19	e17	e39	117	36	26	4.3	2.1	1.5
3	71	40	e37	e19	e19	e62	97	35	25	3.8	1.9	1.4
4	68	39	e34	e19	e20	e90	88	33	21	4.1	1.8	1.2
5	64	39	e36	e19	e22	e110	85	32	19	7.3	1.8	2.0
6	61	41	e34	e19	e23	e136	80	30	17	7.9	1.6	2.2
7	58	42	e33	e19	e24	e132	77	28	15	7.7	1.5	1.9
8	55	43	e32	e19	e25	e119	74	26	13	5.8	2.1	1.3
9	53	e43	e31	e19	e25	e85	71	24	12	5.2	3.5	1.2
10	50	e43	e30	e19	e26	e84	69	23	12	6.9	3.3	1.4
11	49	e42	e28	e19	e27	e107	69	21	13	7.9	3.0	1.6
12	47	e42	e25	e19	e28	e72	68	20	12	7.9	2.5	1.8
13	46	41	e23	e19	e27	65	69	19	11	7.2	2.1	1.8
14	47	41	e22	e19	e26	61	71	18	10	6.7	2.8	1.8
15	46	e42	e22	e18	e25	61	71	17	9.5	6.4	4.0	1.6
16	44	42	e21	e18	e25	55	75	17	8.8	5.6	4.0	2.8
17	43	42	e21	e18	e25	55	78	16	8.3	5.3	3.0	4.7
18	41	e42	e20	e17	e24	53	75	17	7.8	5.4	2.7	6.5
19	41	e41	e20	e17	e25	56	69	17	7.3	5.0	2.3	5.9
20	40	e40	e20	e17	e27	61	64	17	7.1	5.3	2.1	4.3
21	40	e40	e20	e17	e27	72	62	18	6.6	5.7	1.9	2.7
22	40	e40	e20	e17	e28	116	58	19	6.2	5.1	1.7	2.2
23	40	e40	e19	e17	e28	120	60	18	5.7	4.6	1.7	2.0
24	40	e40	e19	e17	e30	141	58	19	5.3	3.8	1.4	1.9
25	40	e41	e19	e16	e32	178	54	19	5.2	3.3	1.3	1.9
26	42	e42	e19	e16	e33	229	52	21	4.6	3.1	1.4	2.5
27	42	e42	e19	e16	e35	238	48	22	4.4	2.6	1.8	2.7
28	43	e42	e19	e16	e38	190	46	21	4.5	2.3	2.2	2.9
29	43	e42	e19	e16	---	113	44	21	4.3	2.4	2.0	3.2
30	43	e42	e19	e16	---	113	41	20	4.0	2.4	1.7	3.2
31	41	---	e19	e16	---	131	---	18	---	2.1	1.5	---
TOTAL	1537	1236	783	551	728	3186	2101	700	325.6	157.1	68.9	73.5
MEAN	49.6	41.2	25.3	17.8	26.0	103	70.0	22.6	10.9	5.07	2.22	2.45
MAX	83	43	42	19	38	238	117	38	26	7.9	4.0	6.5
MIN	40	39	19	16	17	39	41	16	4.0	2.1	1.3	1.2
AC-FT	3050	2450	1550	1090	1440	6320	4170	1390	646	312	137	146
CFSM	.12	.10	.06	.04	.07	.26	.18	.06	.03	.01	.01	.01
IN.	.14	.12	.07	.05	.07	.30	.20	.07	.03	.01	.01	.01

CAL YR 1986 TOTAL 81619 MEAN 224 MAX 3240 MIN 19 AC-FT 161900 CFSM .56 IN. 7.63
WTR YR 1987 TOTAL 11447.1 MEAN 31.4 MAX 238 MIN 1.2 AC-FT 22710 CFSM .08 IN. 1.07

e Estimated

05293000 YELLOW BANK RIVER NEAR ODESSA, MN--Continued

WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1961-62, 1974 to 1981, March to August each year, 1982 to current year.

PERIOD OF DAILY RECORD.--
WATER TEMPERATURES: October 1973 to September 1981, March to August each year, 1982 to current year.
SUSPENDED-SEDIMENT DISCHARGE: October 1973 to September 1981, March to August each year, 1982 to current year.

REMARKS.--Daily sediment concentrations were estimated on the basis of water records and daily sediment samples. Water temperature was obtained when sediment samples were collected.

EXTREMES FOR PERIOD OF DAILY RECORD.--
WATER TEMPERATURES: Maximum daily, 34.5°C, July 31, 1987; minimum daily, 0.0°C on many days during winter periods.
SEDIMENT CONCENTRATIONS: Maximum daily mean, 906 mg/L, Apr. 15, 1986; minimum daily mean, no flow for several days during 1976, 1977, 1980.
SEDIMENT LOADS: Maximum daily, 5,390 tons, Apr. 15, 1986; minimum daily, no flow for several days during 1976, 1977, 1980.

EXTREMES FOR CURRENT PERIOD.--March to August 1987:
WATER TEMPERATURES: Maximum daily, 34.5°C, July 31; minimum daily, 0.0°C on several days during winter period.
SEDIMENT CONCENTRATIONS: Maximum daily mean, 229 mg/L, Mar. 26; minimum daily mean, 35 mg/L, May 23.
SEDIMENT LOADS: Maximum daily, 143 tons, Mar. 27; minimum daily, 0.22 ton, Aug. 30.

WATER TEMPERATURE, DEGREES CENTIGRADE, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987
INSTANTANEOUS VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	---	---	---	---	---	---	5.0	20.0	23.0	21.0	28.0	---
2	---	---	---	---	---	---	4.0	16.0	19.0	21.0	29.0	---
3	---	---	---	---	---	---	3.0	16.0	17.0	21.0	26.0	---
4	---	---	---	---	---	---	5.0	17.0	18.0	23.0	23.0	---
5	---	---	---	---	---	---	7.0	16.0	20.0	22.0	21.0	---
6	---	---	---	---	---	---	8.0	15.0	22.5	23.0	24.0	---
7	---	---	---	---	---	---	9.0	16.0	25.0	25.0	21.0	---
8	---	---	---	---	---	---	10.0	16.0	21.0	24.0	23.0	---
9	---	---	---	---	---	---	13.0	15.0	19.0	24.0	20.0	---
10	---	---	---	---	---	---	11.0	19.0	20.0	25.0	22.0	---
11	---	---	---	---	---	---	10.0	18.0	20.0	26.0	24.0	---
12	---	---	---	---	---	---	10.0	16.0	23.0	23.0	24.0	---
13	---	---	---	---	---	4.0	11.0	18.0	23.5	20.0	21.0	---
14	---	---	---	---	---	---	10.0	17.0	25.0	20.0	22.0	---
15	---	---	.0	---	---	---	11.0	18.0	23.0	20.0	23.0	---
16	---	---	---	---	---	---	12.0	20.0	23.0	23.0	24.0	---
17	---	---	---	---	---	5.0	14.0	21.0	---	25.0	21.0	---
18	---	---	---	---	---	3.0	17.0	18.0	---	26.0	21.0	17.5
19	---	---	---	---	---	3.0	17.0	15.0	---	24.0	20.0	---
20	---	---	---	---	---	4.0	17.5	17.0	---	25.0	21.0	---
21	---	---	---	---	---	5.0	12.0	18.0	---	25.0	23.0	---
22	13.0	---	---	---	---	5.0	11.0	12.0	---	26.0	19.0	---
23	---	---	---	---	---	4.0	14.0	12.0	30.0	27.0	17.0	---
24	---	---	---	---	---	4.0	14.0	16.0	23.0	25.0	17.0	---
25	---	---	---	---	---	5.0	13.0	16.0	21.0	24.0	18.0	---
26	---	---	---	---	---	4.0	15.5	11.0	19.0	27.0	17.0	---
27	---	---	---	---	---	3.0	15.0	19.0	18.0	27.5	16.0	---
28	---	---	---	---	---	2.0	13.0	20.0	22.0	27.0	17.0	---
29	---	---	---	---	---	1.0	20.0	21.0	20.0	28.0	17.0	---
30	---	---	---	.0	---	1.0	14.0	21.0	20.0	28.0	17.0	---
31	---	---	---	---	---	1.0	---	20.0	---	34.5	---	---
MEAN	---	---	---	---	---	---	11.5	17.1	---	24.5	---	---
MAX	---	---	---	---	---	---	20.0	21.0	---	34.5	---	---
MIN	---	---	---	---	---	---	3.0	11.0	---	20.0	---	---

MINNESOTA RIVER BASIN

05293000 YELLOW BANK RIVER NEAR ODESSA, MN.--Continued

SEDIMENT, SUSPENDED CONCENTRATION (MG/L), WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DAY	MEAN CONCEN-TRATION (MG/L)	LOAD (TONS/ DAY)	MEAN CONCEN-TRATION (MG/L)	LOAD (TONS/ DAY)	MEAN CONCEN-TRATION (MG/L)	LOAD (TONS/ DAY)	MEAN CONCEN-TRATION (MG/L)	LOAD (TONS/ DAY)	MEAN CONCEN-TRATION (MG/L)	LOAD (TONS/ DAY)	MEAN CONCEN-TRATION (MG/L)	LOAD (TONS/ DAY)
	OCTOBER		NOVEMBER		DECEMBER		JANUARY		FEBRUARY		MARCH	
1	---	---	---	---	---	---	---	---	---	---	68	7.7
2	---	---	---	---	---	---	---	---	---	---	68	7.2
3	---	---	---	---	---	---	---	---	---	---	68	11
4	---	---	---	---	---	---	---	---	---	---	68	17
5	---	---	---	---	---	---	---	---	---	---	68	20
6	---	---	---	---	---	---	---	---	---	---	68	25
7	---	---	---	---	---	---	---	---	---	---	68	24
8	---	---	---	---	---	---	---	---	---	---	68	22
9	---	---	---	---	---	---	---	---	---	---	68	16
10	---	---	---	---	---	---	---	---	---	---	68	15
11	---	---	---	---	---	---	---	---	---	---	68	20
12	---	---	---	---	---	---	---	---	---	---	68	13
13	---	---	---	---	---	---	---	---	---	---	68	12
14	---	---	---	---	---	---	---	---	---	---	68	11
15	---	---	---	---	---	---	---	---	---	---	69	11
16	---	---	---	---	---	---	---	---	---	---	71	11
17	---	---	---	---	---	---	---	---	---	---	75	11
18	---	---	---	---	---	---	---	---	---	---	80	11
19	---	---	---	---	---	---	---	---	---	---	84	13
20	---	---	---	---	---	---	---	---	---	---	71	12
21	---	---	---	---	---	---	---	---	---	---	58	11
22	---	---	---	---	---	---	---	---	---	---	117	37
23	---	---	---	---	---	---	---	---	---	---	132	43
24	---	---	---	---	---	---	---	---	---	---	155	59
25	---	---	---	---	---	---	---	---	---	---	138	66
26	---	---	---	---	---	---	---	---	---	---	229	142
27	---	---	---	---	---	---	---	---	---	---	223	143
28	---	---	---	---	---	---	---	---	---	---	141	72
29	---	---	---	---	---	---	---	---	---	---	71	22
30	---	---	---	---	---	---	---	---	---	---	86	26
31	---	---	---	---	---	---	---	---	---	---	83	29
TOTAL	---	---	---	---	---	---	---	---	---	---	---	939.9

DAY	MEAN CONCEN-TRATION (MG/L)	LOAD (TONS/ DAY)	MEAN CONCEN-TRATION (MG/L)	LOAD (TONS/ DAY)	MEAN CONCEN-TRATION (MG/L)	LOAD (TONS/ DAY)	MEAN CONCEN-TRATION (MG/L)	LOAD (TONS/ DAY)	MEAN CONCEN-TRATION (MG/L)	LOAD (TONS/ DAY)	MEAN CONCEN-TRATION (MG/L)	LOAD (TONS/ DAY)
	APRIL		MAY		JUNE		JULY		AUGUST		SEPTEMBER	
1	125	37	95	9.7	133	7.2	58	.63	107	.64	---	---
2	100	32	93	9.0	161	11	79	.92	72	.41	---	---
3	110	29	103	9.7	160	11	127	1.3	118	.61	---	---
4	128	30	107	9.5	109	6.2	223	2.5	146	.71	---	---
5	100	23	92	7.9	87	4.5	141	2.8	122	.59	---	---
6	101	22	106	8.6	39	1.8	137	2.9	118	.51	---	---
7	85	18	93	7.0	72	2.9	152	3.2	138	.56	---	---
8	84	17	104	7.3	138	4.8	155	2.4	102	.58	---	---
9	116	22	107	6.9	138	4.5	155	2.2	88	.83	---	---
10	77	14	142	8.8	112	3.6	134	2.5	92	.82	---	---
11	120	22	174	9.9	135	4.7	124	2.6	128	1.0	---	---
12	73	13	187	10	112	3.6	109	2.3	108	.73	---	---
13	100	19	157	8.1	52	1.5	138	2.7	125	.71	---	---
14	76	15	78	3.8	67	1.8	158	2.9	99	.75	---	---
15	66	13	72	3.3	137	3.5	145	2.5	114	1.2	---	---
16	94	19	72	3.3	104	2.5	118	1.8	130	1.4	---	---
17	77	16	106	4.6	110	2.5	149	2.1	127	1.0	---	---
18	70	14	115	5.3	114	2.4	133	1.9	135	.98	---	---
19	63	12	152	7.0	122	2.4	126	1.7	81	.50	---	---
20	89	15	121	5.6	126	2.4	113	1.6	104	.59	---	---
21	65	11	130	6.3	125	2.2	141	2.2	121	.62	---	---
22	73	11	117	6.0	121	2.0	149	2.1	105	.48	---	---
23	76	12	35	1.7	111	1.7	123	1.5	137	.63	---	---
24	56	8.8	50	2.6	91	1.3	118	1.2	159	.60	---	---
25	49	7.1	56	2.9	55	.77	67	.60	75	.26	---	---
26	99	14	122	6.9	99	1.2	121	1.0	84	.32	---	---
27	88	11	46	2.7	50	.59	152	1.1	89	.43	---	---
28	96	12	119	6.7	65	.79	147	.91	68	.40	---	---
29	82	9.7	74	4.2	48	.56	129	.84	64	.35	---	---
30	94	10	177	9.6	58	.63	118	.76	47	.22	---	---
31	---	---	164	8.0	---	---	117	.66	132	.53	---	---
TOTAL	---	508.6	---	202.9	---	96.54	---	56.32	---	19.96	---	---

05294000 POMME DE TERRE RIVER AT APPLETON, MN

LOCATION.--Lat 45°12'10", long 96°01'20", in SW¼NW¼ sec.14, T.120 N., R.43 W., Swift County, Hydrologic Unit 07020002, on left bank 60 ft upstream from bridge on U.S. Highway 59 and State Highway 119 at Appleton and 8 mi upstream from mouth.

DRAINAGE AREA.--905 mi^2, approximately

PERIOD OF RECORD.--March 1931 to September 1935 (no winter records), October 1935 to current year. Prior to October 1953, published as "near Appleton."

REVISED RECORDS.--WSP 1308: 1931(M), 1937(M).

GAGE.--Water-stage recorder and concrete control. Datum of gage is 978.00 ft above National Geodetic Vertical Datum of 1929. Prior to Dec. 22, 1952, nonrecording gage at site 4 mi upstream at datum 25.17 ft higher.

REMARKS.--Records good except those for Nov. 10 to 14, Dec. 31, Jan. 1, 15, 18-20, 22, 23, 25, 26, Feb. 13-15, 18, 19, and Mar. 2, which are fair. Flow affected by lakes above station. Occasional regulation at low flow by old milldam 500 ft upstream.

AVERAGE DISCHARGE.--52 years (water years 1936-87), 115 ft^3/s, 1.73 in/yr, 83,320 acre-ft/yr; median of yearly mean discharge, 95 ft^3/s, 1.43 in/yr, 68,800 acre-ft/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 5,520 ft^3/s, Apr. 11, 1969, gage height, 13.78 ft; maximum gage height, 14.58 ft, Apr. 9, 1969 (backwater from ice); no flow for several periods.

EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 200 ft^3/s and maximum (*):

Date	Time	Discharge (ft^3/s)	Gage height (ft)	Date	Time	Discharge (ft^3/s)	Gage height (ft)
Dec. 2	1530	267	5.58	Mar. 11	1730	333	5.73
Dec. 8	1945	254	5.53	Mar. 25	1000	*472	*6.05
Mar. 7	1615	388	5.87	Mar. 31	1830	396	5.91

Minimum discharge, 16 ft^3/s, Sept. 4, 5, gage height, 4.23 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	389	256	254	e162	129	172	316	156	118	60	44	17
2	379	251	253	146	131	e172	300	150	114	58	43	17
3	376	251	245	149	133	172	286	146	113	57	41	17
4	375	247	207	158	128	171	285	143	114	55	42	16
5	366	243	151	159	132	201	275	137	112	55	40	20
6	356	247	157	158	133	236	265	137	108	55	38	20
7	345	247	207	158	136	330	259	134	103	54	36	18
8	340	251	218	162	142	298	256	130	101	52	37	17
9	338	255	196	155	151	296	250	129	98	49	37	18
10	334	e140	164	149	145	228	246	123	97	49	36	17
11	329	e122	131	130	149	306	245	117	100	49	34	18
12	324	e137	146	146	151	261	247	113	97	48	32	19
13	317	e157	189	162	e153	242	248	111	91	48	30	18
14	312	e197	187	163	e152	238	251	114	88	51	28	18
15	304	228	177	e150	e150	234	251	109	84	40	27	19
16	298	232	180	131	140	223	245	104	81	32	29	22
17	292	228	181	106	140	225	240	101	79	40	29	25
18	284	211	185	e130	e153	223	232	101	88	39	27	23
19	281	210	182	e132	e150	225	226	100	93	39	26	27
20	277	203	179	e132	152	234	219	102	88	37	25	33
21	273	205	177	131	154	246	216	109	84	42	23	32
22	272	218	172	e131	154	254	215	122	80	45	22	30
23	270	215	171	e128	154	272	205	130	76	46	23	29
24	267	214	171	120	157	371	201	124	74	44	23	29
25	266	212	170	e131	158	460	198	124	72	43	22	33
26	263	221	171	e132	164	439	192	131	69	45	22	32
27	258	234	169	133	168	413	164	145	68	44	21	29
28	255	237	168	130	171	381	180	138	66	47	21	25
29	257	247	167	129	---	309	172	129	63	50	20	23
30	266	255	166	129	---	245	162	124	62	47	17	22
31	263	---	e164	130	---	363	---	122	---	45	17	---
TOTAL	9526	6571	5655	4362	4130	8440	7067	3855	2681	1465	912	683
MEAN	307	219	182	141	147	272	236	124	89.4	47.3	29.4	22.8
MAX	389	256	254	163	171	460	316	156	118	60	44	33
MIN	255	122	131	106	128	171	162	100	62	32	17	16
AC-FT	18890	13030	11220	8650	8190	16740	14020	7650	5320	2910	1810	1350
CFSM	.34	.24	.20	.16	.16	.30	.26	.14	.10	.05	.03	.03
IN.	.39	.27	.23	.18	.17	.35	.29	.16	.11	.06	.04	.03

CAL YR 1986 TOTAL 145035 MEAN 397 MAX 1870 MIN 60 AC-FT 287700 CFSM .44 IN. 5.96
WTR YR 1987 TOTAL 55347 MEAN 152 MAX 460 MIN 16 AC-FT 109800 CFSM .17 IN. 2.28

e Estimated

05300000 LAC QUI PARLE RIVER NEAR LAC QUI PARLE, MN

LOCATION.--Lat 44°59'42, long 95°55'09" in SW¼SW¼ sec.27, T.118 N., R.42 W., Lac qui Parle County, Hydrologic Unit 07020003, on right bank 40 ft downstream from highway bridge and 0.5 mi southwest of city of Lac qui Parle.

DRAINAGE AREA.--983 mi^2.

PERIOD OF RECORD.--April 1910 to November 1914; March 1931 to current year (winter records incomplete prior to 1934). Published as "at Lac qui Parle," 1910-14.

REVISED RECORDS.--WSP 1308: 1912(M), 1935(M).

GAGE.--Water-stage recorder. Datum of gage is 951.98 ft above National Geodetic Vertical Datum of 1929 (Minnesota Department of Transportation benchmark). Apr. 27, 1910, to Nov. 15, 1914, nonrecording gage at site 2 mi downstream at different datum. Mar. 17, 1931, to Mar. 9, 1937, non recording gage at site 40 ft upstream at present datum.

REMARKS.--Records good except those for Nov. 8 to Mar. 15 and June 14, 15, 18, which are fair.

AVERAGE DISCHARGE.--56 years (water years 1913, 1932, 1934-87), 134 ft^3/s, 1.85 in/yr. 97,080 acre-ft/yr; median of yearly mean discharges, 110 ft^3/s, 1.52 in/yr, 79,700 acre-ft/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 17,100 ft^3/s, Apr. 10, 1969, gage height, 18.94 ft, from floodmark; maximum gage height, 19.37 ft, Apr. 9, 1965, from floodmark (backwater from ice); no flow at times in several years.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 531 ft^3/s, Oct. 1, gage height, 3.27 ft, occurred on recession following peak of Sept. 23, 1986; maximum independent peak discharge, 528 ft^3/s, Mar. 27, gage height, 3.12 ft; no flow part of each day Sept. 4, 5, 7, 8, 14.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987 MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	503	133	e86	e49	e34	e112	336	125	78	11	14	7.0
2	450	129	e84	e49	e34	e114	327	117	73	12	10	3.0
3	409	129	e81	e49	e34	e117	317	112	62	9.8	7.3	1.3
4	378	126	e77	e49	e34	e120	285	107	51	8.5	5.9	.55
5	351	124	e74	e49	e34	e122	271	105	41	10	5.9	.73
6	326	124	e71	e49	e34	e126	260	100	36	14	5.4	1.0
7	302	124	e67	e48	e37	e128	250	92	34	24	4.4	.28
8	278	e121	e66	e48	e41	e130	241	88	36	20	7.9	.54
9	258	e120	e64	e48	e47	e130	235	77	36	44	11	1.8
10	242	e100	e62	e48	e57	e132	229	66	35	48	9.0	1.2
11	226	e93	e59	e48	e61	e134	225	52	35	54	9.0	1.0
12	214	e97	e58	e48	e65	e136	221	41	36	47	9.0	2.0
13	208	e106	e56	e48	e72	e138	219	33	36	41	9.6	.63
14	199	e103	e55	e47	e76	e136	220	26	e29	57	7.9	.05
15	188	e100	e54	e47	e80	e130	229	23	e29	83	7.3	2.6
16	180	e98	e53	e47	e83	121	250	22	20	80	7.9	2.1
17	175	e97	e52	e47	e87	112	245	18	20	61	5.9	3.7
18	165	e95	e51	e46	e90	103	232	16	e20	45	7.9	3.8
19	161	e93	e51	e45	e92	103	215	20	21	33	9.0	4.6
20	158	e91	e51	e44	e94	112	201	18	20	25	6.3	7.1
21	159	e89	e51	e43	e96	138	198	27	19	43	3.6	6.3
22	158	e88	e50	e43	e98	177	185	63	17	33	2.5	5.8
23	151	e87	e50	e41	e99	249	175	53	16	74	1.0	5.8
24	147	e86	e50	e37	e100	320	169	45	15	168	3.6	5.8
25	148	e86	e50	e36	e102	392	163	53	13	115	9.6	5.8
26	154	e86	e50	e35	e104	485	157	65	13	90	10	5.4
27	152	e87	e50	e35	e106	516	152	63	13	69	8.4	3.6
28	149	e88	e49	e35	e110	485	147	64	15	51	12	3.9
29	145	e89	e49	e35	---	384	140	70	14	34	9.6	3.9
30	145	e88	e49	e35	---	302	133	75	14	25	11	3.9
31	140	---	e49	e34	---	346	---	73	---	18	12	---
TOTAL	7019	3077	1819	1362	2001	6250	6627	1909	887	1447.3	243.9	95.18
MEAN	226	103	58.7	43.9	71.5	202	221	61.6	29.9	46.7	7.87	3.17
MAX	503	133	86	49	110	516	336	125	78	168	14	7.1
MIN	140	86	49	34	34	103	133	16	13	8.5	1.0	05
AC-FT	13920	6100	3610	2700	3970	12400	13140	3790	1780	2870	484	189
CFSM	.23	.10	.06	.04	.07	.21	.22	.06	.03	.05	.01	.00
IN.	.27	.12	.07	.05	.08	.24	.25	.07	.03	.05	.01	.00

CAL YR 1986 TOTAL 172709 MEAN 473 MAX 3480 MIN 25 AC-FT 342600 CFSM .48 IN. 6.54
WTR YR 1987 TOTAL 32747.38 MEAN 89.7 MAX 516 MIN .05 AC-FT 64950 CFSM .09 IN. 1.24

e Estimated

05301000 MINNESOTA RIVER NEAR LAC QUI PARLE, MN

LOCATION.--Lat 45°01'17", long 95°52'05", in NW¼NE¼ sec.24, T.118 N., R.42 W., Chippewa County, Hydrologic Unit 07020004, on left bank 200 ft downstream from dam at Lac qui Parle Outlet, 2.4 mi northwest of city of Lac qui Parle, and 3.5 mi west of Watson.

DRAINAGE AREA.--4,050 mi^2, approximately.

PERIOD OF RECORD.--October 1942 to current year.

GAGE.--Water-stage recorder. Datum of gage is 900.00 ft above National Geodetic Vertican Datum of 1929 (levels by U.S. Army Corps of Engineers). Prior to Nov. 10, 1944, at datum 0.20 ft lower.

REMARKS.--Records good. Part of flow from 2,050 mi^2, of Chippewa River basin at times diverted into Minnesota River above station. Some regulation by Big Stone Lake since Apr. 17, 1937, Lac qui Parle since January 1938. Marsh Lake since Nov. 1, 1939, and Odessa Dam since May 1974.

AVERAGE DISCHARGE.--45 years, 702 ft^3/s, 508,600 acre-ft/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 29,400 ft^3/s, Apr. 12, 1969, gage height, 39.75 ft; no flow Nov. 17, 1942, Sept. 29, 1947, Oct. 19 to Nov. 18, 1951, Nov. 24, 1952, Dec. 9-11, 1976, Feb. 28 to Mar. 5, 1977.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 3,440 ft^3/s, Oct. 12, gage height, 31.68 ft; minimum discharge, 13 ft^3/s, Sept. 20, 21, gage height, 20.31 ft, due to regulation.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	3090	2390	1350	757	496	1260	1290	620	1080	407	69	24
2	3090	2270	1350	725	494	1240	1390	492	1150	398	69	25
3	3160	2230	1350	654	490	1230	1390	498	1140	391	127	25
4	3180	2230	1340	652	493	1220	1400	504	1050	391	187	23
5	3260	2220	1310	647	494	1210	1400	378	880	391	59	24
6	3260	2230	1290	640	495	1200	1400	223	800	318	58	25
7	3300	1990	1270	636	492	1190	1400	221	795	244	59	19
8	3350	1790	1250	616	468	1200	1400	225	677	241	59	19
9	3300	1730	1270	630	475	1200	1400	232	442	238	59	19
10	3220	1600	1290	621	476	1200	1390	244	386	237	61	19
11	3330	1500	1260	617	479	1200	1390	237	391	235	62	19
12	3380	1390	1220	616	482	1200	1390	238	390	225	61	18
13	3200	1230	1180	607	501	1200	1390	242	389	221	61	16
14	3140	1190	1150	580	535	1190	1400	240	389	269	62	16
15	3110	1180	1120	575	536	1190	1450	248	433	259	63	15
16	3040	1180	1100	595	541	1170	1400	255	485	220	62	16
17	2950	1190	1080	592	591	1160	1320	257	486	284	61	22
18	2860	1220	1060	e580	666	1140	1230	279	534	293	59	19
19	2820	1270	1050	e565	667	1120	1220	335	652	296	58	14
20	2800	e1350	1030	e545	719	1120	1230	336	687	302	59	13
21	2810	1340	1020	470	813	1100	1220	339	693	296	59	14
22	2870	1330	1000	462	811	1110	1220	371	667	256	59	20
23	2800	1330	997	e490	812	1130	1210	432	605	211	59	22
24	2680	1310	989	e485	810	1230	1180	436	546	210	62	22
25	2570	1310	982	e485	808	1410	1110	442	420	211	63	48
26	2480	1330	930	485	873	1440	1110	546	406	211	62	21
27	2390	1380	790	484	1030	1460	1100	745	404	213	62	20
28	2310	1370	781	489	1200	1500	1100	753	405	214	62	20
29	2250	1370	772	491	---	1500	1090	876	401	215	62	20
30	2270	1360	771	487	---	1510	991	1030	404	196	59	50
31	2360	---	762	493	---	1450	---	1020	---	122	44	---
TOTAL	90630	46810	34114	17791	17747	38680	38711	13294	18187	8215	2068	647
MEAN	2924	1560	1100	574	634	1248	1290	429	606	265	66.7	21.6
MAX	3380	2390	1350	757	1200	1510	1450	1030	1150	407	187	50
MIN	2250	1180	762	462	468	1100	991	221	386	122	44	13
AC-FT	179800	92850	67670	35290	35200	76720	76780	26370	36070	16290	4100	1280
CFSM	.72	.39	.27	.14	.16	.31	.32	.11	.15	.07	.02	.01
IN.	.83	.43	.31	.16	.16	.36	.36	.12	.17	.08	.02	.01

CAL YR 1986 TOTAL 1035277 MEAN 2836 MAX 12800 MIN 277 AC-FT 2053000 CFSM .70 IN. 9.51
WTR YR 1987 TOTAL 326894 MEAN 896 MAX 3380 MIN 13 AC-FT 648400 CFSM .22 IN. 3.00

e Estimated

MINNESOTA RIVER BASIN

05304500 CHIPPEWA RIVER NEAR MILAN, MN

LOCATION.--Lat 45°06'39", long 95°47'57", in SE¼SE¼ sec.16, T.119 N., R.41 W., Chippewa County, Hydrologic Unit 07020005, on right bank 800 ft upstream from bridge on State Highway 40, 2.0 mi upstream from small tributary, and 5.5 mi east of Milan.

DRAINAGE AREA.--1,870 mi^2, approximately.

PERIOD OF RECORD.--March 1937 to current year.

REVISED RECORDS.--WSP 1145: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 959.69 ft above National Geodetic Vertical Datum of 1929. Prior to June 15, 1942, nonrecording gage on bridge 800 ft downstream at same datum.

REMARKS.--Records good except those for Nov. 8 to Mar. 11, which are fair. Flow regulated by several small lakes upstream from gage.

AVERAGE DISCHARGE.--50 years, 321 ft^3/s, 2.33 in/yr, 232,600 acre-ft/yr; median of yearly mean discharges, 248 ft^3/s, 1.80 in/yr, 180,000 acre-ft/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 11,400 ft^3/s, Apr. 9, 1969, gage height, 15.45 ft; no flow at times during 1940.

EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 400 ft^3/s, and maximum (*):

Date	Time	Discharge (ft^3/s)	Gage height (ft)	Date	Time	Discharge (ft^3/s)	Gage height (ft)
Oct. 1	0015	2,340	6.26	May 22	0715	1,490	4.89
(occurred on recession following peak of Sept. 23, 1986)				May 27	0015	1,280	4.51
Mar. 7	1530	792	a3.60	June 18	0530	1,340	4.59
Mar. 24	1100	*2,200	*6.04	June 23	2245	1,060	4.05
(maximum independent peak)							

a Backwater from ice.

Minimum discharge, 53 ft^3/s, Sept. 16, gage height, 1.40 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	2280	1210	e690	e525	e365	e340	1030	563	911	324	142	79
2	2190	1180	e650	e515	e388	e355	966	547	837	313	136	74
3	2110	1160	e600	e500	e390	e340	936	542	759	292	132	71
4	2050	1140	e540	e490	e395	e385	909	524	688	275	125	72
5	1990	1110	e590	e480	e400	e400	887	502	634	269	123	76
6	1920	1100	e640	e470	e405	e535	869	484	588	261	119	76
7	1880	1080	e690	e460	e410	e740	854	464	551	258	122	75
8	1830	e1070	e700	e450	e415	e760	852	450	515	246	119	73
9	1770	e1060	e670	e448	e415	e740	852	428	545	229	126	71
10	1730	e1060	e630	e445	e415	e740	859	404	513	222	129	66
11	1710	e1040	e620	e444	e410	e755	874	380	524	225	122	63
12	1680	e1040	e625	e443	e410	726	882	355	522	219	115	59
13	1660	e980	e635	e440	e410	651	876	344	487	213	110	57
14	1630	e960	e645	e435	e410	622	875	351	460	209	105	57
15	1600	e946	e655	e425	e410	596	867	341	426	201	105	56
16	1580	e935	e665	e415	e410	579	856	318	457	192	120	59
17	1550	e930	e660	e410	e410	582	843	300	624	181	119	68
18	1530	e910	e660	e400	e410	582	827	289	1190	172	119	93
19	1510	e890	e660	e400	e410	555	803	288	780	167	110	95
20	1480	e873	e660	e395	e410	588	778	291	617	171	102	99
21	1460	e860	e660	e388	e409	649	767	656	538	173	97	103
22	1430	e850	e660	e380	e409	690	743	1420	487	191	92	97
23	1410	e840	e655	e380	e409	1120	733	1130	667	188	89	87
24	1380	e830	e650	e380	e408	2110	712	970	861	178	85	79
25	1360	e820	e645	e380	e408	1690	688	936	615	166	82	74
26	1340	e810	e630	e380	e395	1420	673	1160	516	164	82	75
27	1320	e800	e610	e380	e385	1350	661	1260	461	160	85	75
28	1300	e790	e590	e380	e370	1270	630	1150	420	161	97	68
29	1280	e770	e575	e380	---	1130	607	1090	385	158	97	73
30	1260	e760	e555	e380	---	1120	582	1050	350	158	92	70
31	1230	---	e535	e383	---	1110	---	974	---	155	85	---
TOTAL	50450	28804	19650	13181	11311	25230	24291	19961	17928	6491	3383	2240
MEAN	1627	960	634	425	404	814	810	644	598	209	109	74.7
MAX	2280	1210	700	525	415	2110	1030	1420	1190	324	142	103
MIN	1230	760	535	380	370	340	582	288	350	155	82	56
AC-FT	100100	57130	38980	26140	22440	50040	48180	39590	35560	12870	6710	4440
CFSM	.87	.51	.34	.23	.22	.44	.43	.34	.32	.11	.06	.04
IN.	1.00	.57	.39	.26	.23	.50	.48	.40	.36	.13	.07	.04

CAL YR 1986 TOTAL 536633 MEAN 1470 MAX 4800 MIN 145 AC-FT 1064000 CFSM .79 IN. 10.68
WTR YR 1987 TOTAL 222920 MEAN 611 MAX 2280 MIN 56 AC-FT 442200 CFSM .33 IN. 4.43

e Estimated

05311000 MINNESOTA RIVER AT MONTEVIDEO, MN

LOCATION.--Lat 44°56'00", long 95°44'00", in NW¼NW¼ sec.19, T.117 N., R.40 W., Yellow Medicine County, Hydrologic Unit 07020004, on right bank 100 ft upstream from bridge on U.S. Highway 212, at Montevideo, and 400 ft downstream from Chippewa River.

DRAINAGE AREA.--6,180 mi^2, approximately.

PERIOD OF RECORD.--July 1909 to September 1917, October 1917 to September 1929 (no winter records), October 1929 to current year. Prior to October 1939, published as "near Montevideo." Monthly discharge only for some periods, published in WSP 1308.

REVISED RECORDS.--WSP 1035: 1919(M). WSP 1085: 1935-36. WSP 1508: 1912, 1925(M), 1929(M).

GAGE.--Water-stage recorder. Datum of gage is 909.12 ft above National Geodetic Vertical Datum of 1929. July 22, 1909, to Feb. 4, 1932, nonrecording gage at bridge 600 ft downstream at present datum. Feb. 5, 1932, to Nov. 26, 1934, nonrecording gage at bridge 100 ft downstream at present datum.

REMARKS.--Records good except those for Nov. 19, Dec. 13-15, Jan. 16-20, 23-27, and Apr. 4, 5, which are fair. Flow regulated by Big Stone Lake since April 17, 1937, Lac qui Parle since January 1938, and Marsh Lake since Nov. 1, 1939.

AVERAGE DISCHARGE.--66 years (water years 1910-17, 1930-87), 757 ft^3/s, 548,400 acre-ft/yr; median of yearly mean discharges, 594 ft^3/s, 430,000 acre-ft/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 35,100 ft^3/s, Apr. 12, 1969, gage height, 21.68 ft, from high-water mark; no flow for several days in 1933-34, 1936.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 3,730 ft^3/s, Oct. 1, gage height, 12.21 ft, occurred on recession following peak of Sept. 27, 1986; maximum independent peak discharge, 2,140 ft^3/s, Mar. 25, gage height, 8.80 ft; minimum, 35 ft^3/s, Sept. 22, gage height, 1.26 ft; minimum gage height, 1.25 ft, Sept. 29.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	3640	3090	1530	947	660	1330	2000	1240	1620	565	170	60
2	3560	3100	1530	944	654	1320	1980	999	1700	563	140	48
3	3510	3040	1520	864	647	1320	1970	967	1690	553	132	46
4	3280	2990	1500	826	647	1310	e1960	962	1640	547	248	46
5	3210	2920	1470	821	648	1310	e1950	937	1220	557	181	46
6	3190	2940	1450	816	650	1320	1950	746	960	528	122	45
7	3190	2880	1440	807	649	1340	1950	676	913	352	118	43
8	3200	2700	1410	807	636	1330	1950	541	874	289	119	42
9	3200	2580	1400	808	630	1300	1950	522	656	270	121	42
10	3190	2380	1560	804	632	1310	1950	523	542	289	114	42
11	3180	2070	1500	799	633	1330	1950	518	548	363	112	42
12	3210	1980	1410	798	633	1350	1960	508	534	372	108	44
13	3220	1870	e1390	797	637	1330	1960	515	525	299	104	43
14	3190	1830	e1360	766	630	1420	1960	509	516	298	103	41
15	3150	1570	e1320	743	635	1450	1990	505	518	399	102	40
16	3110	1420	1280	e735	637	1440	1980	507	581	375	103	39
17	3070	1390	1270	e738	649	1430	1940	508	599	372	98	43
18	3010	1380	1260	e740	737	1420	1810	511	606	410	97	44
19	2950	e1370	1240	e740	752	1400	1780	582	783	416	96	43
20	2920	1500	1230	e745	761	1390	1760	605	842	418	96	39
21	2890	1500	1210	695	864	1380	1760	638	856	448	88	37
22	2960	1490	1200	676	861	1380	1750	690	857	410	85	36
23	3200	1480	1200	e705	885	1500	1740	896	774	343	84	37
24	3280	1470	1200	e700	887	1770	1720	914	743	331	83	38
25	3260	1460	1190	e695	887	2090	1640	920	627	324	84	38
26	3190	1470	1180	e695	906	2120	1620	951	577	322	84	58
27	3100	1530	996	e680	1030	2080	1600	1280	569	317	86	43
28	3070	1540	963	e675	1210	2120	1590	1380	573	315	87	38
29	3060	1540	957	e670	---	2110	1580	1400	565	313	79	43
30	3050	1530	954	661	---	2110	1550	1600	563	307	74	70
31	3050	---	951	660	---	2090	---	1610	---	257	71	---
TOTAL	98290	60010	40071	23557	20707	47900	55250	25662	24572	11922	3389	1316
MEAN	3171	2000	1293	760	740	1545	1842	828	819	385	109	43.9
MAX	3640	3100	1560	947	1210	2120	2000	1610	1700	565	248	70
MIN	2890	1370	951	660	630	1300	1550	505	516	257	71	36
AC-FT	195000	119000	79480	46730	41070	95010	109600	50900	48740	23650	6720	2610
CFSM	.51	.32	.21	.12	.12	.25	.30	.13	.13	.06	.02	.01
IN.	.59	.36	.24	.14	.12	.29	.33	.15	.15	.07	.02	.01

CAL YR 1986 TOTAL 1191312 MEAN 3264 MAX 13800 MIN 390 AC-FT 2363000 CFSM .53 IN. 7.17
WTR YR 1987 TOTAL 412646 MEAN 1131 MAX 3640 MIN 36 AC-FT 818500 CFSM .18 IN. 2.48

e Estimated

05311400 SOUTH BRANCH YELLOW MEDICINE RIVER AT MINNEOTA, MN

LOCATION.--Lat 44°33'50", long 95°59'50", in SE¼ sec.26, T.113 N., R.43 W., Lyon County, Hydrologic Unit 07020004, on downstream side of bridge on State Highway 68, 0.5 mi northwest of Minneota and 6 mi upstream from mouth.

DRAINAGE AREA.--111 mi^2, approximately.

PERIOD OF RECORD.--April 1960 to September 1981 and October 1982 to current year. Monthly and daily discharge for the period Apr. 1, 1960, to June 30, 1960, published in WSP 1914. Operated as high-flow partial-record station October 1981 to September 1982.

GAGE.--Nonrecording gage and crest-stage gage. Datum of gage is 1,150.00 ft above National Geodetic Vertical Datum of 1929.

REMARKS.--Records good except those for Nov. 9-25, and Dec. 4 to Mar. 5, 9-18, which are fair.

AVERAGE DISCHARGE.--26 years (water years 1961-1981, 1983-1987), 28.5 ft^3/s, 3.49 in/yr, 20,650 acre-ft/yr; median of yearly mean discharges, 20 ft^3/s, 2.45 in/yr, 14,500 acre-ft/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 4,430 ft^3/s, Apr. 8, 1969, gage height, 13.41 ft; no flow at times.

EXTREMES FOR CURRENT YEAR.--Peak discharge above base of 82 ft^3/s and maximum (*):

Date	Time	Discharge (ft^3/s)	Gage height (ft)	Date	Time	Discharge (ft^3/s)	Gage height (ft)
Mar 26	about 0500	331	6.08	July 5	about 1630	*774	*8.69
Mar. 30	0700	144	4.75				

Minimum daily discharge, 1.0 ft^3/s, Sept. 4, 5, gage height, 2.40 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	71	27	31	e22	e7.9	e13	85	25	14	3.0	2.6	1.2
2	61	26	28	e22	e9.2	e13	74	25	12	2.9	2.3	1.1
3	60	26	24	e22	e10	e14	69	25	11	2.6	2.2	1.2
4	58	25	e23	e22	e11	e15	62	25	9.0	2.9	2.0	1.0
5	60	25	e23	e22	e9.6	e16	58	24	7.7	225	1.9	1.0
6	60	26	e22	e22	e9.8	20	56	23	6.4	65	1.9	1.9
7	65	25	e22	e22	e11	24	55	22	5.7	47	1.9	1.6
8	60	31	e22	e21	e11	25	54	21	5.2	30	1.9	1.3
9	55	e31	e22	e21	e11	e23	52	20	4.9	22	3.7	1.2
10	51	e31	e21	e21	e11	e22	51	19	4.9	18	2.2	1.2
11	51	e31	e21	e20	e11	e21	50	19	7.7	16	1.9	1.2
12	51	e30	e21	e20	e11	e20	54	18	6.2	42	1.8	1.4
13	49	e30	e20	e20	e12	e20	58	16	6.0	20	1.8	1.9
14	[illegible]	e30	e19	e20	e12	e20	61	14	5.4	18	1.8	1.5
15	44	e30	e19	e21	e11	e20	65	12	4.9	14	1.8	1.2
16	43	e29	e20	e20	e11	e19	60	11	4.6	12	2.1	1.2
17	41	e29	e20	e19	e11	e19	55	10	4.6	9.4	1.8	2.8
18	39	e29	e20	e18	e11	e19	50	10	5.0	8.1	1.6	2.7
19	38	e29	e21	e16	e11	19	43	11	4.5	7.5	1.6	2.6
20	37	e29	e21	e15	e11	22	40	11	4.3	6.6	1.6	2.6
21	36	e28	e21	e13	e11	25	37	12	4.5	8.8	1.6	2.4
22	36	e28	e22	e12	e11	30	34	12	4.3	5.9	1.6	2.6
23	35	e28	e22	e11	e11	56	32	12	4.3	5.2	1.6	1.8
24	35	e27	e22	e10	e11	172	32	12	4.1	5.9	1.6	1.8
25	33	e27	e22	e9.4	e12	292	29	14	4.5	5.2	1.6	1.8
26	32	27	e22	e8.7	e12	321	29	16	4.3	4.6	1.6	1.8
27	32	31	e22	e8.1	e12	259	28	15	4.1	4.1	1.8	1.9
28	32	32	e22	e7.8	e12	167	27	15	3.6	3.8	2.2	1.6
29	30	32	e22	e7.6	---	106	27	13	3.2	3.6	1.8	1.5
30	30	32	e22	e7.6	---	134	26	19	3.1	3.1	1.6	1.6
31	28	---	e22	e7.8	---	98	---	14	---	2.8	1.3	---
TOTAL	1400	861	681	509.0	305.5	2044	1453	515	174.0	625.0	58.7	50.5
MEAN	45.2	28.7	22.0	16.4	10.9	65.9	48.4	16.6	5.80	20.2	1.89	1.68
MAX	71	32	31	22	12	321	85	25	14	225	3.7	2.8
MIN	28	25	19	7.6	7.9	13	26	10	3.1	2.6	1.3	1.0
AC-FT	2780	1710	1350	1010	606	4050	2880	1020	345	1240	116	100
CFSM	.41	.26	.20	.15	.10	.59	.44	.15	.05	.18	.02	.02
IN.	.47	.29	.23	.17	.10	.69	.49	.17	.06	.21	.02	.02

CAL YR 1986 TOTAL 29530 MEAN 80.9 MAX 1030 MIN 12 AC-FT 58570 CFSM .73 IN. 9.90
WTR YR 1987 TOTAL 8676.7 MEAN 23.8 MAX 321 MIN 1.0 AC-FT 17210 CFSM .21 IN. 2.91

e Estimated

05313500 YELLOW MEDICINE RIVER NEAR GRANITE FALLS, MN

LOCATION.--Lat 44°43'18", long 95°31'07", in SW¼ sec.35, T.115 N., R.39 W., Yellow Medicine County, Hydrologic Unit 07020004, on right bank 50 ft downstream from highway bridge, 6 mi upstream from mouth, and 8 mi south of town of Granite Falls.

DRAINAGE AREA.--653 mi^2.

PERIOD OF RECORD.--March 1931 to September 1935 (no winter records), October 1935 to September 1938, October 1939 to current year. Monthly discharge only for some periods, published in WSP 1308.

REVISED RECORDS.--WSP 1508: 1931, 1934(M), 1937(M), 1946(M), 1950(M).

GAGE.--Water-stage recorder. Datum of gage is 960.64 ft above National Geodetic Vertical Datum of 1929. Mar. 16, 1931, to June 13, 1938, nonrecording gage, on bridge 50 ft upstream at present datum. Oct. 12, 1939, to Nov. 30, 1952, nonrecording gage 500 ft downstream at present datum.

REMARKS.--Records good except those for Nov. 10 to Mar. 9, which are fair.

AVERAGE DISCHARGE.--51 years (water years 1936-38, 1940-87), 125 ft^3/s, 2.60 in/yr, 90,560 acre-ft/yr; median of yearly mean discharges, 84 ft^3/s, 1.75 in/yr, 60,900 acre-ft/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 17,200 ft^3/s, Apr. 10. 1969, gage height, 14.90 ft; no flow at times in 1931, 1933, 1948, 1959.

EXTREMES OUTSIDE PERIOD OF RECORD.--Flood in June 1919 reached a stage of 17.5 ft, from information by local residents, discharge, 25,200 ft^3/s.

EXTREMES FOR CURRENT YEAR.--Peak discharge greater than base discharge of 300 ft^3/s and maximum (*):

Date	Time	Discharge (ft^3/s)	Gage height (ft)	Date	Time	Discharge (ft^3/s)	Gage height (ft)
Oct. 1	0015	978	4.84	May 31	1900	656	4.32
(occurred on recession following peak of Sept. 23, 1986)				July 7	0715	548	4.03
Mar. 27	1200	*1,030	*4.95	July 14	1000	438	3.81

Minimum discharge, 11 ft^3/s, Sept. 16; minimum gage height, 2.32 ft, Sept. 3, 4, 5.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	912	249	e235	e100	e43	e86	571	125	577	35	31	16
2	794	240	e231	e100	e44	e90	514	129	414	34	28	15
3	711	240	e220	e100	e45	e93	465	126	325	30	27	13
4	652	230	e150	e97	e45	e98	408	118	256	28	25	12
5	614	226	e140	e97	e46	e108	389	112	217	39	22	16
6	559	226	e140	e97	e47	e130	368	104	178	136	21	16
7	525	226	e145	e97	e48	e165	353	100	150	498	19	15
8	488	259	e150	e97	e50	e188	342	97	127	385	21	15
9	447	254	e145	e97	e51	e180	330	93	107	378	23	15
10	423	e250	e135	e97	e52	169	321	98	104	303	21	14
11	400	e188	e133	e97	e54	154	314	82	120	255	19	16
12	381	e196	e129	e97	e56	153	310	74	151	261	20	15
13	369	e221	e129	e97	e57	146	309	74	173	338	19	13
14	362	e221	e128	e97	e59	136	313	74	155	422	18	14
15	355	e221	e128	e95	e61	132	316	67	123	355	17	14
16	340	e216	e128	e85	e62	124	327	64	102	282	23	12
17	333	e204	e125	e79	e63	124	319	62	102	217	21	15
18	319	e180	e125	e74	e64	126	298	60	93	165	19	15
19	309	e180	e123	e68	e66	129	279	61	83	132	17	16
20	306	e180	e122	e62	e66	139	254	71	78	112	17	15
21	299	e180	e121	e57	e68	165	229	118	73	110	16	17
22	293	e180	e118	e52	e70	205	218	166	69	94	17	18
23	290	e180	e116	e49	e72	310	200	155	65	87	16	17
24	286	e180	e112	e47	e74	541	184	141	58	78	15	16
25	283	e184	e110	e46	e76	809	175	144	55	68	14	15
26	283	e196	e108	e44	e79	943	159	162	50	64	13	16
27	283	e217	e107	e44	e82	1020	150	188	46	59	13	21
28	275	e226	e105	e43	e84	969	140	195	48	53	16	18
29	275	e230	e105	e43	---	821	136	221	48	46	17	19
30	264	e235	e105	e43	---	679	129	441	39	41	17	16
31	259	---	e105	e43	---	587	---	603	---	35	15	---
TOTAL	12689	6415	4173	2341	1684	9719	8820	4315	4186	5140	597	465
MEAN	409	214	135	75.5	60.1	314	294	139	140	166	19.3	15.5
MAX	912	259	235	100	84	1020	571	603	577	498	31	21
MIN	259	180	105	43	43	86	129	60	39	28	13	12
AC-FT	25170	12720	8280	4640	3340	19280	17490	8560	8300	10200	1180	922
CFSM	.63	.33	.21	.12	.09	.48	.45	.21	.21	.25	.03	.02
IN.	.72	.37	.24	.13	.10	.55	.50	.25	.24	.29	.03	.03

CAL YR 1986 TOTAL 174983 MEAN 479 MAX 3550 MIN 35 AC-FT 347100 CFSM .73 IN. 9.97
WTR YR 1987 TOTAL 60544 MEAN 166 MAX 1020 MIN 12 AC-FT 120100 CFSM .25 IN. 3.45

e Estimated

MINNESOTA RIVER BASIN

05315000 REDWOOD RIVER NEAR MARSHALL, MN

LOCATION.--Lat 44°25'49", long 95°50'43", in SE¼SW¼ sec.12, T.111 N., R.42 W., Lyon County, Hydrologic Unit 07020006, on right bank 2.0 mi upstream from Redwood River diversion structure on southwest edge of town of Marshall, MN. Prior to Apr. 10, 1980, at site 5 mi downstream.

DRAINAGE AREA.--303 mi^2.

PERIOD OF RECORD.--March 1940 to current year. Monthly discharge only for some periods, published in WSP 1308.

GAGE.--Water-stage recorder. Datum of gage is 1,188.23 ft above National Geodetic Vertical Datum of 1929. March 1940 to April 9, 1980, nonrecording gage 5.0 mi downstream from present site at datum 43.35 ft lower (crest-stage gage added June 12, 1968). Since March 1964, nonrecording gage and crest-stage gage on diversion channel 1.5 mi downstream at datum 1,100.00 ft above National Geodetic Vertical Datum of 1929.

REMARKS.--Records good except those for Oct. 12-28, Nov. 8 to Feb. 26, and Apr. 21 to May 11, which are fair. Water diverted at medium and high stages into diversion channel 2.0 mi below station. Diversion began Mar. 18, 1964. Unknown amount of natural diversion into Cottonwood River basin occurs at extremely high stages 0.8 mi below station.

AVERAGE DISCHARGE.--47 years, 57.5 ft^3/s, 2.58 in/yr, 41,660 acre-ft/yr; median of yearly mean discharges, 42 ft^3/s, 1.88 in/yr, 30,400 acre-ft/yr.

EXTREMES FOR PERIOD OF RECORD.--River only, maximum discharge, 5,370 ft^3/s, June 17, 1957, gage height, 10.14 ft; maximum gage height, 11.05 ft, Apr. 6, 1951, from floodmark; no flow at times.

Diversion only, maximum discharge, 4,440 ft^3/s, Apr. 10, 1969, gage height, 78.45 ft; no flow on many days.

Combined flow, maximum discharge, 5,590 ft^3/s, Apr. 10, 1969; no flow at times.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 954 ft^3/s, Mar. 26, gage height, 11.99 ft; minimum discharge, 4.5 ft^3/s, Aug. 11, gage height, 6.18 ft; minimum gage height, 6.14 ft, Aug. 31.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	361	90	e100	e63	e17	28	457	e119	42	14	8.2	6.5
2	342	86	e100	e63	e18	29	362	e112	38	13	7.6	6.1
3	325	86	e96	e63	e18	30	375	e108	35	12	7.1	5.8
4	308	85	e86	e63	e19	32	351	e102	32	17	6.6	5.5
5	292	83	e84	e63	e20	36	331	e95	29	37	5.7	6.4
6	273	83	e83	e63	e21	44	319	e86	27	29	6.6	6.8
7	266	83	e82	e62	e22	53	311	e74	24	32	6.4	6.4
8	257	e82	e80	e62	e20	53	304	e62	22	25	7.0	6.6
9	235	e82	e77	e61	e21	52	299	e53	19	23	9.4	5.6
10	220	e81	e75	e58	e22	51	302	e46	25	25	7.8	6.0
11	210	e80	e73	e56	e23	51	301	e36	32	28	6.2	8.5
12	e198	e80	e71	e54	e23	51	312	e33	30	37	6.1	12
13	e186	e79	e70	e54	e22	51	300	33	27	47	6.7	9.2
14	e177	e78	e69	e53	e22	52	308	31	24	47	6.4	8.1
15	e170	e78	e69	e51	e22	51	310	29	21	47	7.6	8.8
16	e160	e77	e70	e47	e22	51	291	27	19	44	9.4	11
17	e155	e76	e70	e41	e22	52	284	25	65	41	8.2	14
18	e147	e76	e70	e38	e22	57	269	27	32	40	8.3	11
19	e142	e75	e70	e36	e22	66	248	26	26	39	7.8	11
20	e139	e74	e70	e34	e22	86	235	26	23	38	7.0	9.6
21	e133	e74	e70	e32	e22	107	e210	33	23	35	7.2	8.8
22	e128	e73	e69	e28	e22	120	e198	31	21	30	7.0	9.0
23	e123	e73	e68	e22	e22	225	e190	32	18	26	6.6	8.0
24	e118	e74	e67	e20	e23	467	e182	30	17	26	6.0	8.5
25	e112	e75	e65	e18	e23	796	e170	35	17	22	6.6	7.7
26	e108	e80	e64	e18	24	926	e162	44	17	20	8.3	7.5
27	e103	e86	e64	e17	26	806	e150	47	17	17	9.6	7.4
28	e98	e92	e64	e17	28	639	e138	44	16	15	10	6.9
29	95	e96	e64	e17	---	389	e132	51	15	13	9.3	7.3
30	93	e98	e64	e17	---	508	e124	52	14	10	9.3	7.7
31	92	---	e63	e17	---	499	---	47	---	8.7	6.0	---
TOTAL	5766	2435	2287	1308	610	6458	7925	1596	767	855.7	232.0	243.7
MEAN	186	81.2	73.8	42.2	21.8	208	264	51.5	25.6	27.6	7.48	8.12
MAX	361	98	100	63	28	926	457	119	65	47	10	14
MIN	92	73	63	17	17	28	124	25	14	8.7	5.7	5.5
AC-FT	11440	4830	4540	2590	1210	12810	15720	3170	1520	1700	460	483
CFSM	.61	.27	.24	.14	.07	.69	.87	.17	.08	.09	.02	.03
IN.	.71	.30	.28	.16	.07	.79	.97	.20	.09	.11	.03	.03

CAL YR 1986 TOTAL 77706 MEAN 213 MAX 1840 MIN 18 AC-FT 154100 CFSM .70 IN. 9.54
WTR YR 1987 TOTAL 30483.4 MEAN 83.5 MAX 926 MIN 5.5 AC-FT 60460 CFSM .28 IN. 3.74

e Estimated

MINNESOTA RIVER BASIN

05316500 REDWOOD RIVER NEAR REDWOOD FALLS, MN

LOCATION.--Lat 44°31'25", long 95°10'20", in SE¼NE¼ sec.9, T.112 N., R.36 W., Redwood County, Hydrologic Unit 07020006, on right bank 4 ft upstream from highway bridge, 3 mi west of town of Redwood Falls, and 8.5 mi upstream from mouth.

DRAINAGE AREA.--697 mi^2.

PERIOD OF RECORD.--July 1909 to September 1914 (no winter records except 1911-12). August 1930 to September 1935 (no winter records), October 1935 to current year.

GAGE.--Water-stage recorder. Datum of gage is 972.33 ft above National Geodetic Vertical Datum of 1929. July 1909 to September 1914, nonrecording gage at bridge 20 ft downstream at datum 0.22 ft lower. August 1930 to Oct. 25, 1949, nonrecording gage, at bridge 20 ft downstream at present datum.

REMARKS.--Records good except those for Nov. 9 to Mar. 10, which are fair. Natural discharge affected by unknown amount of interbasin flow between Yellow Medicine, Redwood, and Cottonwood River basins during extreme floods.

AVERAGE DISCHARGE.--53 years (water years 1912, 1936-87), 127 ft^3/s, 2.47 in/yr, 92,010 acre-ft/yr; median of yearly mean discharges, 88 ft^3/s, 1.71 in/yr, 63,800 acre-ft/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 19,700 ft^3/s, June 18, 1957, gage height, 15.92 ft, from floodmark; no flow for several days in January 1940 and for part of each day Aug. 19, 20, 1959.

EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 400 ft^3/s and maximum (*):

Date	Time	Discharge (ft^3/s)	Gage height (ft)	Date	Time	Discharge (ft^3/s)	Gage height (ft)
Mar. 27	2100	*1,030	*4.30	No other peak greater than base discharge.			

Minimum discharge, 11 ft^3/s, Sept. 4, 5, 6, 7, 10, and 30; minimum gage height, 1.47 ft, Sept. 5, 6.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	830	222	e165	e93	e48	e51	604	165	230	46	34	15
2	748	216	e162	e93	e48	e50	533	158	215	42	31	13
3	695	221	e150	e93	e48	e54	512	155	191	38	28	14
4	633	210	e128	e93	e48	e62	457	147	169	36	25	12
5	590	207	e128	e93	e48	e67	391	144	151	43	25	11
6	548	206	e130	e93	e48	e79	351	145	133	117	24	11
7	518	206	e130	e93	e48	e99	373	143	117	125	23	12
8	484	212	e130	e92	e48	e99	359	139	103	136	23	14
9	448	e207	e123	e92	e48	e97	344	134	92	137	29	12
10	424	e204	e114	e92	e48	e97	330	130	92	143	37	12
11	402	e200	e117	e92	e48	97	326	122	103	139	34	13
12	391	e195	e117	e92	e48	103	320	112	120	137	26	17
13	377	e190	e117	e91	e48	101	317	109	114	142	25	19
14	369	e188	e116	e90	e48	97	322	105	104	145	23	24
15	356	e185	e115	e88	e48	94	324	98	91	145	23	18
16	344	e181	e115	e86	e48	91	322	91	79	136	25	17
17	329	e179	e115	e81	e48	87	312	83	79	124	24	21
18	313	e178	e114	e77	e48	90	293	79	174	108	29	36
19	301	e173	e113	e74	e48	98	276	83	150	95	22	35
20	293	e170	e112	e73	e49	105	261	83	118	86	20	31
21	285	e168	e111	e72	e49	122	243	99	101	86	19	30
22	278	e165	e109	e60	e50	153	238	194	91	94	18	27
23	269	e163	e107	e56	e51	341	227	158	88	78	17	23
24	264	e161	e103	e53	e52	700	209	139	78	99	16	20
25	262	e160	e100	e51	e52	873	201	150	74	93	16	18
26	251	e162	e97	e50	e52	982	194	224	69	75	16	17
27	259	e164	e96	e49	e52	1020	189	252	62	62	17	16
28	256	e168	e95	e48	e52	1030	181	230	61	55	19	14
29	246	e170	e94	e48	---	1020	179	210	54	49	21	13
30	237	e169	e94	e48	---	1020	173	223	48	43	21	12
31	233	---	e94	e48	---	948	---	247	---	38	18	---
TOTAL	12233	5598	3611	2354	1371	9927	9361	4551	3351	2892	728	547
MEAN	395	187	116	75.9	49.0	320	312	147	112	93.3	23.5	18.2
MAX	830	222	165	93	52	1030	604	252	230	145	37	36
MIN	233	160	94	48	48	50	173	79	48	36	16	11
AC-FT	24260	11100	7160	4670	2720	19690	18570	9030	6650	5740	1440	1080
CFSM	.57	.27	.17	.11	.07	.46	.45	.21	.16	.13	.03	.03
IN.	.65	.30	.19	.13	.07	.53	.50	.24	.18	.15	.04	.03

CAL YR 1986 TOTAL 171515 MEAN 470 MAX 4400 MIN 45 AC-FT 340200 CFSM .67 IN. 9.15
WTR YR 1987 TOTAL 56524 MEAN 155 MAX 1030 MIN 11 AC-FT 112100 CFSM .22 IN. 3.02

e Estimated

05317000 COTTONWOOD RIVER NEAR NEW ULM, MN

LOCATION.--Lat 44°17'29", long 94°26'24", in SW¼NE¼ sec.33, T.110 N., R.30 W., Brown County, Hydrologic Unit 07020008, on left bank 600 ft upstream from highway bridge, 1.8 mi south of New Ulm, and 3.2 mi upstream from mouth.

DRAINAGE AREA.--1,280 mi^2, approximately.

PERIOD OF RECORD.--July 1909 to December 1913, March 1931 to March 1938, August 1938 to current year (winter records incomplete prior to 1936).

REVISED RECORDS.--WSP 355: 1912.

GAGE.--Water-stage recorder. Datum of gage is 796.83 ft above National Geodetic Vertical Datum of 1929. July 1, 1909, to Dec. 13, 1913, nonrecording gage at site 2.7 mi upstream at different datum. Mar. 15, 1931, to Mar. 31, 1938, nonrecording gage 2.2 mi upstream at datum 11.41 ft higher. Aug. 23, 1938, to June 25, 1948, nonrecording gage at present site and datum.

REMARKS.--Records good except those for Nov. 8, 9, 13-29, Dec. 7-10, and Dec. 12 to Mar. 7, which are fair.

AVERAGE DISCHARGE.--53 years (water years 1912-13, 1936-37, 1939-87), 324 ft^3/s, 3.44 in/yr, 234,700 acre-ft/yr; median of yearly mean discharges, 228 ft^3/s, 2.42 in/yr, 165,000 acre-ft/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 28,700 ft^3/s, Apr. 10, 1969, gage height, 19.15 ft; maximum gage height, 20.86 ft, Apr. 8, 1965, from floodmark (backwater from ice); minimum discharge observed, 0.5 ft^3/s, Nov. 27, 1952; minimum gage height, 0.72 ft, Nov. 20, 1964.

EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 1,300 ft^3/s and maximum (*):

Date	Time	Discharge (ft^3/s)	Gage height (ft)
Mar. 27	0500	*2,920	*8.93

No other peak greater than base discharge.

Minimum discharge, 38 ft^3/s, Sept. 30, gage height, 1.50 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1960	662	604	e260	e148	e195	1330	376	460	173	138	50
2	1790	635	587	e257	e148	e192	1200	367	423	155	122	47
3	1640	625	575	e252	e148	e192	1080	363	386	140	109	46
4	1560	613	528	e245	e148	e192	978	351	350	128	99	45
5	1500	594	414	e235	e148	e215	906	340	319	123	91	44
6	1420	585	360	e230	e148	e240	852	330	293	146	85	44
7	1340	574	e350	e228	e148	e270	812	320	270	163	80	43
8	1270	e570	e335	e228	e148	306	777	312	249	165	84	41
9	1190	e560	e315	e230	e149	305	745	304	231	185	94	42
10	1130	539	e300	e230	e150	291	718	296	224	191	89	43
11	1090	502	261	e222	e160	268	696	287	220	179	87	46
12	1080	303	e300	e220	e165	245	682	277	223	201	76	50
13	1070	e310	e310	e220	e170	249	689	266	231	302	72	52
14	1070	e315	e320	e220	e172	251	690	268	258	407	70	50
15	1050	e320	e330	e220	e170	241	689	262	240	505	67	49
16	1020	e325	e334	e220	e170	238	689	255	213	434	73	58
17	974	e330	e334	e218	e170	235	672	248	214	362	71	54
18	937	e335	e334	e210	e170	241	638	237	294	302	70	55
19	904	e340	e334	e204	e170	248	599	229	430	253	68	60
20	876	e355	e330	e195	e175	260	572	230	649	216	64	70
21	858	e370	e325	e185	e172	279	545	256	868	199	62	67
22	839	e380	e320	e175	e170	312	526	241	686	176	60	64
23	825	e395	e310	e165	e170	399	502	254	682	161	57	62
24	809	e405	e300	e155	e170	1460	479	305	490	303	54	56
25	795	e460	e295	e150	e168	2470	459	333	419	614	51	53
26	779	e500	e285	e148	e170	2800	447	361	328	534	51	49
27	768	e520	e275	e148	e178	2890	432	495	277	405	71	47
28	754	e555	e270	e148	e192	2610	417	592	252	291	66	43
29	728	e600	e268	e148	---	2200	401	602	233	229	63	40
30	703	610	e265	e148	---	1780	390	556	198	190	59	38
31	682	---	e262	e148	---	1500	---	503	---	160	54	---
TOTAL	33411	14187	10730	6262	4565	23574	20612	10416	10610	7992	2357	1508
MEAN	1078	473	346	202	163	760	687	336	354	258	76.0	50.3
MAX	1960	662	604	260	192	2890	1330	602	868	614	138	70
MIN	682	303	261	148	148	192	390	229	198	123	51	38
AC-FT	66270	28140	21280	12420	9050	46760	40880	20660	21040	15850	4680	2990
CFSM	.84	.37	.27	.16	.13	.59	.54	.26	.28	.20	.06	.04
IN.	.97	.41	.31	.18	.13	.69	.60	.30	.31	.23	.07	.04

CAL YR 1986 TOTAL 430500 MEAN 1179 MAX 9520 MIN 158 AC-FT 853900 CFSM .92 IN. 12.51
WTR YR 1987 TOTAL 146224 MEAN 401 MAX 2890 MIN 38 AC-FT 290000 CFSM .31 IN. 4.25

e Estimated

MINNESOTA RIVER BASIN

05317200 LITTLE COTTONWOOD RIVER NEAR COURTLAND, MN

LOCATION.--Lat 44°14'47", long 94°20'19", in SW¼NE¼ sec.17, T.109 N., R.29 W., Blue Earth County, Hydrologic Unit 07020007, on right bank 30 ft downstream from bridge on State Highway 68, 0.7 mi above mouth, 1.5 mi south of Courtland.

DRAINAGE AREA.--230 mi^2, approximately.

PERIOD OF RECORD.--October 1973 to current year. September 1959 to September 1973, operated as a low-flow station only.

GAGE.--Water-stage recorder. Datum of gage is 788.25 ft above National Geodetic Vertical Datum of 1929.

REMARKS.--Records good except those for estimated daily discharges and period July 24 to Aug. 17, which are fair.

AVERAGE DISCHARGE.--14 years, 60.6 ft^3/s, 3.58 in/yr, 43,900 acre-ft/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 1,340 ft^3/s, Mar. 16, 1985, gage height, 8.96 ft; minimum discharge, 0.01 ft^3/s, Sept. 17, 1977.

EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 180 ft^3/s and maximum (*):

Date	Time	Discharge (ft^3/s)	Gage height (ft)	Date	Time	Discharge (ft^3/s)	Gage height (ft)
Oct. 1	0030	*278	*5.16	No other peak greater than base discharge.			
(occurred on recession following peak of Sept. 19, 1986)							
Oct. 13	--	220 (daily)	--				

Minimum discharge, 1.8 ft^3/s, Sept. 30, gage height, 1.96 ft; minimum gage height, 1.89 ft, Sept 6, 7, 8, 9, 10.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	263	85	73	37	16	30	141	43	48	9.1	7.5	2.4
2	240	84	75	35	17	25	129	43	43	8.3	6.3	2.2
3	223	83	68	33	19	28	118	43	39	7.2	6.9	2.1
4	208	81	37	34	19	36	110	41	36	6.5	5.1	2.1
5	194	78	e38	34	20	39	103	40	33	6.3	4.6	2.1
6	183	79	e39	35	21	40	99	38	30	6.1	4.0	2.1
7	176	79	e40	36	22	44	94	36	27	8.3	3.6	2.0
8	e170	85	e40	36	24	44	90	34	25	11	4.8	2.0
9	e163	72	e41	35	25	44	87	34	22	11	7.1	2.0
10	e157	61	e39	33	24	38	84	32	22	11	6.0	2.0
11	e150	59	e37	31	24	40	84	30	24	11	5.0	2.2
12	e200	e59	e36	31	25	36	84	30	23	21	4.4	2.4
13	e220	e58	e36	32	26	36	84	29	21	18	3.8	2.3
14	e205	e57	e36	33	26	38	83	28	20	17	3.6	2.6
15	e195	e56	e37	31	25	37	83	28	16	17	3.7	2.6
16	e185	e54	e37	26	22	37	81	27	13	17	4.2	2.8
17	e175	e53	e37	26	22	37	79	25	13	14	3.9	2.9
18	e168	52	e37	25	25	38	75	23	13	12	4.1	2.7
19	e158	50	e37	24	24	41	70	22	12	12	3.6	2.7
20	e150	57	e37	22	24	44	66	24	13	10	3.2	2.9
21	e143	52	e37	21	24	49	63	32	16	10	3.0	2.8
22	e136	52	e37	21	25	54	63	39	15	8.3	2.8	2.9
23	e128	48	e37	20	28	60	61	37	31	7.0	2.7	3.0
24	e123	51	e37	15	25	77	58	35	25	37	2.6	2.9
25	e118	52	e37	13	26	104	55	37	21	48	2.5	2.5
26	e114	57	e38	12	26	121	54	55	18	32	2.5	2.4
27	e108	58	e38	12	30	134	51	60	14	23	2.5	2.2
28	103	73	38	13	35	146	49	59	13	18	3.1	2.1
29	99	71	38	13	---	146	47	63	13	14	3.3	1.9
30	94	73	38	14	---	145	44	59	10	10	2.8	1.8
31	90	---	37	15	---	153	---	53	---	8.8	2.5	---
TOTAL	5039	1929	1269	798	669	1941	2389	1179	669	449.9	126.7	71.6
MEAN	163	64.3	40.9	25.7	23.9	62.6	79.6	38.0	22.3	14.5	4.09	2.39
MAX	263	85	75	37	35	153	141	63	48	48	7.5	3.0
MIN	90	48	36	12	16	25	44	22	10	6.1	2.5	1.8
AC-FT	9990	3830	2520	1580	1330	3850	4740	2340	1330	892	251	142
CFSM	.71	.28	.18	.11	.10	.27	.35	.17	.10	.06	.02	.01
IN.	.82	.31	.21	.13	.11	.31	.39	.19	.11	.07	.02	.01

CAL YR 1986 TOTAL 51489 MEAN 141 MAX 942 MIN 12 AC-FT 102100 CFSM .61 IN. 8.33
WTR YR 1987 TOTAL 16530.2 MEAN 45.3 MAX 263 MIN 1.8 AC-FT 32790 CFSM .20 IN. 2.67

e Estimated

05319500 WATONWAN RIVER NEAR GARDEN CITY, MN

LOCATION.--Lat 44°02'47", long 94°11'43", in SW¼NE¼ sec.28, T.107 N., R.28 W., Blue Earth County, Hydrologic Unit 07020010, on left bank 25 ft downstream from bridge on County Highway 13, 1.5 miles west of Garden City, 7.3 mi upstream from mouth, and 9.2 mi downstream from Perch Creek.

DRAINAGE AREA.-- 812 mi^2.

PERIOD OF RECORD.--March 1940 to September 1945, September 1976 to current year. 1953, 1960, 1961, and 1969 (one or more discharge measurements each year).

REVISED RECORDS.--WDR MN-78-2: 1977.

GAGE.--Water-stage recorder. Datum of gage is 905.05 ft above National Geodetic Vertical Datum of 1929. Prior to September 30, 1945, nonrecording gage at site 200 ft upstream and at datum 0.17 ft higher.

REMARKS.--Records good except those for Nov. 9, 10, Nov. 14 to Feb. 23, and June 17-23, which are fair.

AVERAGE DISCHARGE.--16 years (water years 1941-45, 1977-87), 347 ft^3/s, 5.80 in/yr, 251,400 acre-ft/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 5,620 ft^3/s, May 21, 1944, gage height 9.84 ft, datum then in use; minimum daily, 1.9 ft^3/s, Jan. 20 to Feb. 8, 1977; minimum gage height, 0.27 ft, July 23, 1940, datum then in use.

EXTREMES OUTSIDE PERIOD OF RECORD.--Flood of Apr. 7, 1965, reached a stage of 18.89 ft at datum 0.17 ft higher, from floodmarks, discharge, 19,000 ft^3/s.

EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 900 ft^3/s and maximum (*):

Date	Time	Discharge (ft^3/s)	Gage height (ft)	Date	Time	Discharge (ft^3/s)	Gage height (ft)
Nov. 14	1400	Ice jam	*5.86				
Mar. 28	1100	*1,100	4.01				

No other peak greater than base discharge.

Minimum discharge, 11 ft^3/s, Aug. 6, 7, gage height, 0.63 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	895	408	e320	e140	e100	99	744	186	238	43	21	15
2	796	396	e315	e140	e99	122	691	179	213	40	18	15
3	743	387	e300	e135	e99	94	609	172	198	36	16	15
4	729	383	e280	e135	e98	97	550	161	175	33	14	16
5	721	372	e250	e130	e98	112	509	150	153	32	13	16
6	698	365	e245	e130	e97	118	480	145	136	33	12	16
7	663	359	e235	e130	e97	127	457	143	123	36	11	16
8	629	362	e225	e125	e96	137	435	140	113	38	13	20
9	592	e360	e220	e125	e95	144	414	136	106	43	19	15
10	552	e340	e215	e125	e95	140	397	134	101	42	24	15
11	544	308	e210	e125	e95	136	385	131	100	44	24	19
12	633	319	e205	e120	e86	144	389	120	101	55	30	22
13	737	315	e200	e120	e98	144	399	110	118	57	21	22
14	766	e315	e195	e120	e91	145	421	110	111	57	18	22
15	735	e310	e190	e115	e90	143	431	108	97	52	19	24
16	699	e310	e190	e115	e86	140	433	104	85	55	20	25
17	656	e310	e185	e115	e95	142	419	99	e79	50	21	27
18	608	e310	e180	e115	e104	146	399	93	e74	44	20	26
19	574	e310	e175	e115	e114	158	367	90	e74	47	17	26
20	550	e310	e175	e110	e122	175	339	90	e75	45	14	24
21	530	e315	e170	e110	e118	198	324	91	e78	46	13	21
22	511	e320	e170	e110	e110	228	307	104	e77	41	13	19
23	505	e330	e165	e105	e110	260	288	137	e75	39	13	20
24	504	e335	e160	e105	116	333	272	133	68	41	14	18
25	500	e340	e155	e105	119	296	250	133	65	42	15	18
26	492	e340	e155	e105	124	576	237	161	64	39	16	18
27	483	e335	e150	e105	116	961	229	269	63	34	16	18
28	472	e330	e150	e105	104	1050	223	310	60	28	19	19
29	455	e330	e145	e100	---	1040	207	312	54	26	17	16
30	434	e325	e145	e100	---	917	200	292	49	24	18	14
31	415	---	e145	e100	---	812	---	267	---	22	17	---
TOTAL	18821	10149	6220	3635	2872	9334	11805	4810	3123	1264	536	577
MEAN	607	338	201	117	103	301	393	155	104	40.8	17.3	19.2
MAX	895	408	320	140	124	1050	744	312	238	57	30	27
MIN	415	308	145	100	86	94	200	90	49	22	11	14
AC-FT	37330	20130	12340	7210	5700	18510	23420	9540	6190	2510	1060	1140
CFSM	.75	.42	.25	.14	.13	.37	.48	.19	.13	.05	.02	.02
IN.	.86	.46	.28	.17	.13	.43	.54	.22	.14	.06	.02	.03

CAL YR 1986 TOTAL 228918 MEAN 627 MAX 2900 MIN 71 AC-FT 454100 CFSM .77 IN. 10.49
WTR YR 1987 TOTAL 73146 MEAN 200 MAX 1050 MIN 11 AC-FT 145100 CFSM .25 IN. 3.35

e Estimated

05320000 BLUE EARTH RIVER NEAR RAPIDAN, MN

LOCATION.--Lat 44°05'44", long 94°06'33", in SE¼SE¼ sec.6, T 107 N., R.27 W., Blue Earth County, Hydrologic Unit 07020009, on left bank 0.2 mi downstream from powerplant (reactivated in 1984) operated by Rapidan Redevelopment Limited Partnership, 2 mi west of Rapidan, 3.5 mi downstream from Watonwan River, and 7.8 mi upstream from Le Sueur River.

DRAINAGE AREA.--2,430 mi^2, approximately.

PERIOD OF RECORD.--July 1909 to November 1910 (published as "at Rapidan Mills," no winter records), October 1939 to September 1945, July 1949 to current year.

REVISED RECORDS.--WSP 895: Drainage area. WSP 1508: 1910.

GAGE.--Water-stage recorder. Datum of gage is 807.83 ft above National Geodetic Vertical Datum of 1929. July 20, 1909, to Apr. 28, 1910, nonrecording gage at site 0.2 mi upstream at different datum. Apr. 29 to Nov. 12, 1910, nonrecording gage at site 800 ft upstream at different datum. Oct. 4 to Nov. 14, 1939, nonrecording gage at present site and datum.

REMARKS.--Records good except those for estimated daily discharges, which are fair.

AVERAGE DISCHARGE.--44 years (water years 1940-45, 1950-87), 932 ft^3/s, 5.21 in/yr, 675,200 acre-ft/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 43,100 ft^3/s, Apr. 9, 1965, gage height, 21.36 ft, from floodmark; minimum, 6.9 ft^3/s, Oct. 12, 1955, gage height, 1.04 ft.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 4,300 ft^3/s, Oct. 15, gage height, 5.85 ft; minimum, 51 ft^3/s, July 4, gage height, 1.35 ft, due to regulation.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1540	1190	1040	e425	239	e290	1490	719	625	132	215	105
2	1480	1320	1050	e410	240	e285	1510	722	635	122	247	245
3	1300	1070	1010	e410	e260	275	1430	762	744	112	284	199
4	1310	1220	974	e410	223	296	1360	658	634	106	197	173
5	1350	1180	789	e370	e240	316	1170	534	536	100	358	132
6	1730	987	638	e370	237	314	1050	632	335	99	641	103
7	1850	1180	667	e380	e250	318	1120	495	332	113	569	101
8	1290	998	e650	e370	e270	360	1100	475	612	111	191	102
9	1650	1020	e630	e350	e260	404	1060	501	336	134	154	102
10	1400	1160	e625	e335	e260	346	968	422	260	159	316	102
11	1320	887	593	288	e260	379	932	472	368	195	472	102
12	1670	610	e570	e335	e257	350	1100	537	471	367	498	102
13	2250	569	e610	e350	e265	350	871	396	281	624	511	102
14	3200	e465	e630	e345	e265	356	972	374	269	1520	211	102
15	3360	e670	e640	e355	e260	336	1090	384	513	1700	230	102
16	3560	e920	e630	e345	e255	368	1070	363	463	1630	342	116
17	2840	e910	e610	e325	e255	344	1190	317	303	1310	488	137
18	2360	e920	e590	e275	e255	345	1240	382	269	1090	295	137
19	2230	e700	e585	e270	e250	343	1250	400	227	930	292	118
20	1940	e730	e580	e270	e260	408	1210	350	225	710	326	129
21	1900	e740	e550	e270	265	414	1120	377	222	733	352	130
22	1820	e700	e535	e275	e275	431	1040	336	277	668	226	130
23	1620	e770	e525	e280	e285	475	1020	395	249	661	224	128
24	1670	e770	e510	e235	e295	592	962	385	230	645	362	133
25	1740	e770	e500	e230	e300	906	875	325	202	513	313	130
26	1570	793	e460	e230	305	1220	878	440	199	533	152	113
27	1400	810	e500	204	e300	1450	858	452	182	441	152	84
28	1320	946	e490	172	e295	1650	834	635	174	362	150	106
29	1460	920	e480	e200	---	1750	771	630	166	353	150	105
30	1400	950	e475	e230	---	1680	759	625	144	322	154	106
31	1300	---	e485	200	---	1540	---	621	---	298	162	---
TOTAL	56830	26875	19621	9514	7381	18891	32300	15116	10483	16793	9234	3676
MEAN	1833	896	633	307	264	609	1077	488	349	542	298	123
MAX	3560	1320	1050	425	305	1750	1510	762	744	1700	641	245
MIN	1290	465	460	172	223	275	759	317	144	99	150	84
AC-FT	112700	53310	38920	18870	14640	37470	64070	29980	20790	33310	18320	7290
CFSM	.75	.37	.26	.13	.11	.25	.44	.20	.14	.22	.12	.05
IN.	.87	.41	.30	.15	.11	.29	.49	.23	.16	.26	.14	.06

CAL YR 1986 TOTAL 664259 MEAN 1820 MAX 13000 MIN 143 AC-FT 1318000 CFSM .75 IN. 10.17
WTR YR 1987 TOTAL 226714 MEAN 621 MAX 3560 MIN 84 AC-FT 449700 CFSM .26 IN. 3.47

e Estimated

05320500 LE SUEUR RIVER NEAR RAPIDAN, MN

LOCATION.--Lat 44°06'40", long 94°02'28", in SW¼ sec.35, T.108 N., R.27 W., Blue Earth County, Hydrologic Unit 07020011, on right bank 600 ft downstream from highway bridge, 1.8 mi northeast of Rapidan, and 2.3 mi upstream from mouth.

DRAINAGE AREA.--1,100 mi^2, approximately.

PERIOD OF RECORD.--October 1939 to September 1945, July 1949 to current year.

GAGE.--Water-stage recorder. Datum of gage is 775.76 ft above National Geodetic Vertical Datum of 1929. Prior to Nov. 15, 1939, nonrecording gage at same site and datum.

REMARKS.--Records good except those for estimated daily discharges, which are fair.

AVERAGE DISCHARGE.--44 years (water years 1940-45, 1950-87), 471 ft^3/s, 5.81 in/yr, 341,200 acre-ft/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 24,700 ft^3/s, Apr. 8, 1965, gage height, 22.10 ft, from floodmark; maximum gage height, 22.72 ft, May 22, 1960, from floodmark; minimum daily discharge, 1.6 ft^3/s, Feb. 9-25, 1959; minimum gage height, 0.65 ft, Sept. 7-13, 1976.

EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 1,300 ft^3/s and maximum (*):

Date	Time	Discharge (ft^3/s)	Gage height (ft)	Date	Time	Discharge (ft^3/s)	Gage height (ft)
Oct. 16	---	*e2,500 (mean daily)	---	No other peak greater than base discharge.			

Minimum discharge, 26 ft^3/s, July 4, 5, 6, gage height, 0.91 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	e720	606	381	e165	e112	155	258	145	81	38	276	113
2	e680	591	383	e160	e112	133	261	140	75	34	216	102
3	e645	561	378	e157	e112	138	253	134	70	31	172	90
4	e620	541	313	e155	e112	167	239	127	64	28	142	78
5	e605	532	275	e152	e112	180	226	120	58	27	153	72
6	e580	513	e265	e150	e112	198	213	115	54	29	326	67
7	e560	494	e250	e148	e112	225	206	108	50	34	350	64
8	e540	499	e230	e146	e112	228	199	101	46	41	317	62
9	e525	467	e215	e142	e112	228	193	95	43	43	321	54
10	e520	454	201	e140	e112	210	190	93	46	61	330	49
11	e515	337	227	e139	e112	195	186	88	50	83	597	47
12	e580	340	255	e138	e112	190	184	95	54	136	665	49
13	e750	358	e260	e137	e112	180	180	85	51	121	561	45
14	e1100	368	e260	e135	e112	185	177	83	47	268	462	47
15	e1800	e360	e260	e132	e113	180	174	78	44	460	402	48
16	e2500	e355	e258	e130	e115	177	174	76	39	446	380	42
17	e2200	e352	e255	e128	e118	175	173	72	38	369	342	46
18	e1900	e350	e252	e127	e120	177	176	71	39	280	410	42
19	1700	e340	e248	e126	e122	180	172	70	36	228	515	43
20	1510	e338	e240	e124	e125	185	169	72	36	181	497	47
21	1340	332	e230	e121	e128	192	163	74	39	169	428	45
22	1190	e335	e220	e120	e130	198	165	74	34	165	352	42
23	1080	337	e213	e118	143	207	167	77	32	146	299	39
24	998	336	e209	e117	150	225	159	74	45	186	261	43
25	922	341	e200	e116	147	256	157	73	71	152	220	48
26	866	332	e192	e114	147	280	163	78	68	132	191	49
27	806	358	e188	e113	155	296	161	76	52	147	175	55
28	763	358	e182	e112	155	305	157	75	47	217	164	55
29	714	379	e178	e112	---	310	154	85	46	204	151	49
30	668	379	e174	e112	---	291	156	90	43	324	138	49
31	631	---	e170	e112	---	270	---	87	---	344	126	---
TOTAL	30528	12243	7562	4098	3436	6516	5605	2821	1498	5124	9939	1681
MEAN	985	408	244	132	123	210	187	91.0	49.9	165	321	56.0
MAX	2500	606	383	165	155	310	261	145	81	460	665	113
MIN	515	332	170	112	112	133	154	70	32	27	126	39
AC-FT	60550	24280	15000	8130	6820	12920	11120	5600	2970	10160	19710	3330
CFSM	.90	.37	.22	.12	.11	.19	.17	.08	.05	.15	.29	.05
IN.	1.03	.41	.26	.14	.12	.22	.19	.10	.05	.17	.34	.06

CAL YR 1986 TOTAL 332223 MEAN 910 MAX 8070 MIN 60 AC FT 659000 CFSM .83 IN. 11.24
WTR YR 1987 TOTAL 91051 MEAN 249 MAX 2500 MIN 27 AC-FT 180600 CFSM .23 IN. 3.08

e Estimated

MINNESOTA RIVER BASIN

05325000 MINNESOTA RIVER AT MANKATO, MN

LOCATION.--Lat 44°09'58", long 94°00'57", in NW¼NE¼ sec.13, T.108 N., R.27 W., Nicollet County, Hydrologic Unit 07020007, on left bank 12 ft downstream from bridge on U.S. Highway 169 in North Mankato, 1.1 mi downstream from Blue Earth River and at mile 107.1 upstream from Mississippi River.

DRAINAGE AREA.--14,900 mi^2, approximately.

WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--May 1903 to current year (no winter records 1904, 1906-10, 1918-29). Monthly discharge only for some periods, published in WSP 1308. Published as "near Mankato": 1903-21.

REVISED RECORDS.--WSP 875: 1917. WSP 955: Drainage area. WSP 1085: 1929. WSP 1238: 1903, 1908, 1919. WSP 1508: 1916(M), 1918(M), 1926(M), 1928, 1930, 1932(M), 1938(M). WDR-MN-76-1: 1881(M).

GAGE.--Water-stage recorder. Datum of gage is 747.92 ft above National Geodetic Vertical Datum of 1929. Prior to Oct. 19, 1921, nonrecording gage, at site 1.1 mi upstream at datum 6.4 ft higher. Mar. 15, 1922, to Nov. 30, 1924, nonrecording gage, and Dec. 1, 1924 to May 24, 1971, recorder at site 0.5 mi downstream at present datum. May 25, 1971 to Aug. 14, 1977, recorder at site 0.2 mi downstream at present datum. Aug. 14, 1977 to July 27, 1978, nonrecording gage at present site and datum.

REMARKS.--Records good except those for Nov. 20-26 and Dec. 8 to Mar. 6, which are fair.

AVERAGE DISCHARGE.--66 years (water years 1905, 1911-17, 1930-87), 3,027 ft^3/s, 2.76 in/yr, 2,193,000 acre-ft/yr; median of yearly mean discharges, 2,570 ft^3/s, 2.34 in/yr, 1,860,000 acre-ft/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 94,100 ft^3/s, Apr. 10, 1965, gage height, 29.09 ft; minimum observed, 26 ft^3/s, Aug. 4, 1934.

EXTREMES OUTSIDE PERIOD OF RECORD.--Maximum stage since Apr. 26, 1881, 29.9 ft, present site and datum, from floodmark, discharge, 110,000 ft^3/s.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 17,000 ft^3/s, Oct. 1, gage height, 15.82 ft, occurred on recession following peak of Sept. 26, 1986; maximum independent peak discharge, 8,170 ft^3/s, Mar. 29, gage height, 10.53 ft; minimum discharge, 393 ft^3/s, Sept. 30, gage height, 2.61 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	16400	7360	5080	e2600	e1500	e2210	7850	3780	3890	1780	1580	596
2	15300	7370	5120	e2550	e1500	e2280	7750	3730	4050	1700	1440	588
3	14400	7090	5010	e2520	e1500	e2350	7470	3700	4180	1620	1390	682
4	13600	7070	5010	e2500	e1500	e2480	7130	3510	4170	1530	1310	562
5	13100	6990	4650	e2440	e1500	e2600	6750	3130	3920	1500	1220	502
6	12900	6720	4450	e2400	e1500	e2750	6270	3080	3610	1500	1630	476
7	12500	6780	4320	e2370	e1500	2920	6150	2940	3400	1550	1620	471
8	11500	6610	e4200	e2320	e1500	3010	5920	2730	3320	1560	1370	455
9	10900	6550	e4100	e2300	e1520	3120	5720	2750	2880	1600	1280	424
10	10300	6560	e4000	e2250	e1540	3100	5540	2500	2530	1780	1220	403
11	9850	6200	e3900	e2210	e1560	3050	5370	2430	2460	1780	1570	408
12	10600	5700	e3800	e2190	e1550	2970	5430	2320	2440	1930	1740	433
13	11500	e5220	e3700	e2120	e1560	2890	5280	2180	2220	2170	1720	408
14	12700	e5000	e3600	e2080	e1580	2910	5230	2130	2080	3230	1470	423
15	12900	4750	e3500	e2000	e1600	2900	5350	2080	2180	4110	1190	418
16	12800	5280	e3450	e1920	e1630	2850	5270	2050	2150	4110	1320	418
17	11800	5110	e3400	e1880	e1680	2850	5330	1980	1970	3630	1370	454
18	10800	5200	e3300	e1800	e1700	2910	5330	2000	1920	3190	1280	476
19	10300	5190	e3250	e1720	e1720	2930	5280	1980	2220	2910	1340	476
20	9690	e5200	e3200	e1670	e1730	2970	5200	1920	2670	2470	1300	492
21	9320	e5190	e3150	e1610	e1790	3040	5030	1940	2790	2380	1300	509
22	9020	e5180	e3100	e1580	e1800	3090	4800	1980	2820	2210	1170	509
23	8630	e5170	e3050	e1560	e1850	3210	4690	2090	2790	2120	1010	509
24	8440	e5150	e3000	e1500	e1900	3570	4540	2480	2870	2530	1020	515
25	8370	e5100	e2900	e1500	e1950	5030	4390	2660	2870	2650	1010	515
26	8060	e5000	e2870	e1500	e2000	6290	4320	2800	2670	2610	802	509
27	7870	4850	e2830	e1500	e2060	7150	4270	2830	2490	2410	706	449
28	7600	4900	e2800	e1500	e2140	7710	4110	3310	2290	2110	715	418
29	7700	4920	e2750	e1500	---	8070	4010	3680	2100	1920	698	403
30	7650	4930	e2700	e1500	---	8100	3840	3810	1900	1810	653	398
31	7490	---	e2650	e1500	---	7970	---	3830	---	1760	644	---
TOTAL	333990	172340	112840	60590	46860	119280	163620	84330	83850	70160	38088	14299
MEAN	10770	5745	3640	1955	1674	3848	5454	2720	2795	2263	1229	477
MAX	16400	7370	5120	2600	2140	8100	7850	3830	4180	4110	1740	682
MIN	7490	4750	2650	1500	1500	2210	3840	1920	1900	1500	644	398
AC-FT	662500	341800	223800	120200	92950	236600	324500	167300	166300	139200	75550	28360
CFSM	.72	.39	.24	.13	.11	.26	.37	.18	.19	.15	.08	.03
IN.	.83	.43	.28	.15	.12	.30	.41	.21	.21	.18	.10	.04

CAL YR 1986 TOTAL 3595760 MEAN 9851 MAX 35900 MIN 1260 AC-FT 7132000 CFSM .66 IN. 8.98
WTR YR 1987 TOTAL 1300247 MEAN 3562 MAX 16400 MIN 398 AC-FT 2579000 CFSM .24 IN. 3.25

e Estimated

05325000 MINNESOTA RIVER AT MANKATO, MN--Continued

WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1963-66, 1968 to current year.

PERIOD OF DAILY RECORD.--
WATER TEMPERATURES: October 1967 to September 30, 1981, October 1982 to September 30, 1983.
SUSPENDED-SEDIMENT DISCHARGE: October 1967 to current year.

REMARKS.--During the winter period, daily suspended-sediment samples were collected monthly and daily sediment load was estimated on the basis of water records and these sediment samples. Water temperature was obtained once-daily during open water period and occasionally for the winter period. Temperature records are considered fair.

EXTREMES FOR PERIOD OF DAILY RECORD.--
WATER TEMPERATURES: Maximum daily, 30.5°C July 15, 1980; minimum daily, 0.0°C on many days each year.
SEDIMENT CONCENTRATIONS: Maximum daily mean, 2,850 mg/L, Aug. 7, 1968; minimum daily mean, 13 mg/L, Nov. 24, 1974, Feb. 18, 19, 1979.
SEDIMENT LOADS: Maximum daily, 247,000 tons, Apr. 9, 1969; minimum daily, 5.2 tons, Nov. 6, 1976.

EXTREMES FOR CURRENT YEAR.--
WATER TEMPERATURES: Maximum daily, 30.0°C, July 24, 25, 26; minimum daily, 0.0°C on many days during winter period.
SEDIMENT CONCENTRATIONS: Maximum daily mean, 553 mg/L, Mar. 26; minimum daily mean, 61 mg/L, Sept. 8, 15.
SEDIMENT LOADS: Maximum daily, 9,390 tons, Mar. 26; minimum daily, 70 tons, Sept. 15.

WATER TEMPERATURE, DEGREES CENTIGRADE, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987
INSTANTANEOUS VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	16.0	---	---	---	---	---	4.0	17.5	---	26.0	---	23.5
2	15.5	---	---	---	---	---	4.5	16.0	---	---	---	24.0
3	15.5	---	---	---	---	---	5.0	17.0	---	26.0	---	24.5
4	13.5	---	---	---	.0	---	6.5	17.0	---	25.0	---	24.5
5	14.0	---	---	---	---	---	8.0	16.5	---	26.0	---	24.5
6	12.5	---	---	---	---	---	10.0	18.0	---	26.5	---	23.5
7	12.5	---	---	---	---	---	11.0	19.0	---	26.0	---	24.0
8	13.0	---	---	---	---	---	11.5	20.0	---	26.0	---	24.0
9	11.5	---	---	---	---	---	11.5	18.0	---	27.5	---	23.0
10	10.5	---	---	---	---	---	12.0	21.0	22.0	28.0	---	21.5
11	11.0	---	---	---	2.0	---	13.0	21.5	24.0	25.0	---	21.5
12	9.0	---	---	---	---	---	14.0	21.5	26.0	24.5	---	20.0
13	8.0	---	---	---	---	---	12.5	21.5	26.0	24.5	---	20.0
14	8.0	---	---	---	---	---	12.5	21.5	25.5	24.5	---	21.5
15	7.5	---	---	---	---	---	13.0	20.5	26.0	24.5	---	22.5
16	8.0	---	---	---	---	---	15.0	22.0	27.0	24.5	---	22.0
17	9.5	---	.0	---	---	---	16.5	24.0	27.0	25.0	---	22.0
18	10.0	---	---	---	---	---	17.0	20.0	28.0	25.0	---	20.5
19	11.5	---	---	---	---	---	19.0	21.0	26.0	27.0	26.5	18.5
20	---	---	---	---	---	---	17.0	23.0	26.5	29.0	26.5	19.0
21	---	---	---	---	---	---	15.0	19.0	27.0	29.0	26.5	20.0
22	---	---	---	---	---	---	14.0	17.0	28.0	30.0	26.5	19.0
23	---	---	---	---	---	---	15.5	18.0	27.5	29.0	22.0	21.0
24	---	---	---	---	---	8.0	15.5	17.0	26.0	30.0	22.0	19.0
25	---	---	---	---	---	7.5	16.0	16.5	26.0	30.0	22.5	21.0
26	---	.5	---	---	---	7.0	18.0	18.0	24.5	30.0	21.0	19.5
27	---	---	---	---	---	7.5	17.0	20.0	25.0	---	21.0	23.5
28	---	---	---	---	---	6.0	17.0	21.0	25.0	---	21.0	21.5
29	11.0	---	---	---	---	4.5	17.0	22.0	---	---	22.0	21.5
30	---	---	---	---	---	4.0	17.5	---	24.5	---	24.0	21.0
31	---	---	---	---	---	4.5	---	---	---	---	23.0	---
MEAN	---	---	---	---	---	---	13.2	---	---	---	---	21.7
MAX	---	---	---	---	---	---	19.0	---	---	---	---	24.5
MIN	---	---	---	---	---	---	4.0	---	---	---	---	18.5

SEDIMENT, SUSPENDED CONCENTRATION (MG/L), WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DAY	MEAN CONCENTRATION (MG/L)	LOAD (TONS/DAY)	MEAN CONCENTRATION (MG/L)	LOAD (TONS/DAY)	MEAN CONCENTRATION (MG/L)	LOAD (TONS/DAY)	MEAN CONCENTRATION (MG/L)	LOAD (TONS/DAY)	MEAN CONCENTRATION (MG/L)	LOAD (TONS/DAY)	MEAN CONCENTRATION (MG/L)	LOAD (TONS/DAY)
	OCTOBER		NOVEMBER		DECEMBER		JANUARY		FEBRUARY		MARCH	
1	180	7970	106	2110	113	155[illegible]	103	723	103	417	113	674
2	200	8260	107	2130	112	1550	103	709	115	466	114	702
3	173	6730	107	2050	112	1520	103	701	127	514	115	730
4	192	7050	108	2060	111	1500	103	695	139	563	115	770
5	180	6370	108	2040	110	1380	103	679	135	547	116	814
6	141	4910	108	1960	110	1320	103	667	131	531	117	869
7	180	6070	109	2000	109	1270	103	659	127	514	117	922
8	188	5840	109	1950	108	1220	103	645	123	498	118	959
9	220	6470	110	1950	108	1200	103	640	119	488	119	1000
10	225	6260	110	1950	107	1160	103	626	116	482	119	996
11	297	7900	110	1840	106	1120	103	615	113	476	120	988
12	277	7930	111	1710	106	1090	103	609	113	473	121	970
13	208	6460	111	1560	105	1050	103	590	113	476	121	944
14	238	8160	112	1510	104	1010	103	578	113	482	122	959
15	252	8950	112	1440	104	983	103	556	113	488	123	963
16	266	9190	112	1600	103	959	103	534	113	497	123	946
17	250	7960	113	1560	103	946	103	523	113	513	124	954
18	187	5450	113	1590	103	918	103	501	113	519	125	982
19	141	3920	114	1600	103	904	103	478	113	525	126	997
20	135	3530	114	1600	103	890	103	464	113	528	127	1020
21	131	3[illegible]00	114	1600	103	876	103	448	113	546	128	1050
22	130	3170	115	1610	103	862	103	439	113	549	129	1080
23	128	2980	115	1610	103	848	103	434	113	564	130	1130
24	125	2850	115	1600	103	834	103	417	113	580	141	1360
25	122	2760	116	1600	103	806	103	417	113	595	445	6040
26	118	2570	116	1570	103	798	103	417	113	610	553	9390
27	114	2420	116	1520	103	787	103	417	113	629	481	9290
28	110	2260	115	1520	103	779	103	417	113	653	446	9280
29	106	2200	115	1530	103	765	103	417	---	---	422	9190
30	106	2190	114	1520	103	751	103	417	---	---	374	8180
31	106	2140	---	---	103	737	103	417	---	---	314	6760
TOTAL	---	164220	---	51890	---	32383	---	16849	---	14723	---	80909
YEAR		593263										

DAY	MEAN CONCENTRATION (MG/L)	LOAD (TONS/DAY)	MEAN CONCENTRATION (MG/L)	LOAD (TONS/DAY)	MEAN CONCENTRATION (MG/L)	LOAD (TONS/DAY)	MEAN CONCENTRATION (MG/L)	LOAD (TONS/DAY)	MEAN CONCENTRATION (MG/L)	LOAD (TONS/DAY)	MEAN CONCENTRATION (MG/L)	LOAD (TONS/DAY)
	APRIL		MAY		JUNE		JULY		AUGUST		SEPTEMBER	
1	278	5890	147	1500	291	3060	152	731	70	299	73	117
2	263	5290	150	1510	321	3510	155	711	69	268	71	113
3	256	5160	124	1240	345	3890	195	853	68	255	76	140
4	218	4200	115	1090	347	3850	140	578	67	237	80	121
5	217	3950	117	989	340	3600	136	620	66	217	80	108
6	258	4370	105	873	326	3180	160	648	82	361	80	103
7	236	3920	112	889	314	2880	160	670	69	302	87	111
8	227	3180	129	951	302	2710	168	708	86	318	61	75
9	169	2930	127	943	289	2250	165	713	277	957	155	177
10	182	2950	139	938	273	1860	164	788	204	672	123	135
11	185	2680	144	945	270	1790	155	745	220	933	90	100
12	168	2460	136	852	254	1670	203	1060	194	911	94	111
13	165	2350	121	712	246	1470	147	861	175	813	112	125
14	175	2470	116	667	205	1150	170	1480	162	643	89	103
15	193	2790	134	753	188	1110	253	2810	153	492	61	70
16	166	2360	132	731	181	1050	287	3180	164	584	91	104
17	150	2160	103	551	164	872	288	2620	150	555	95	118
18	163	2350	94	508	156	809	253	2180	145	501	80	104
19	166	2370	96	513	218	1310	202	1590	139	503	96	125
20	163	2290	106	550	249	1800	187	1250	118	414	77	104
21	191	2590	125	655	243	1830	175	1120	109	383	78	109
22	170	2200	131	700	242	1840	133	794	99	313	100	139
23	145	1840	117	660	269	20[illegible]	170	973	86	235	105	146
24	161	1970	146	978	321	24[illegible]0	310	2120	86	237	95	134
25	174	2060	138	991	250	1940	205	1470	95	259	100	141
26	194	2260	165	1250	217	1560	144	1010	103	223	119	166
27	198	2280	216	1650	202	1360	135	878	103	196	106	130
28	170	1900	234	2090	186	1150	123	701	94	181	83	95
29	138	1490	255	2530	163	924	89	461	77	145	105	116
30	135	1400	275	2830	148	759	75	367	80	141	120	131
31	---	---	282	2920	---	---	70	333	100	174	---	---
TOTAL	---	86110	---	34959	---	59704	---	35223	---	12722	---	3571
YEAR		593263										

05327000 HIGH ISLAND CREEK NEAR HENDERSON, MN

LOCATION.--Lat 44°34'19", long 93°55'13", in NE¼NW¼ sec.26, T.113 N., R.26 W., Sibley County, Hydrologic Unit 07020012, on left bank 20 ft downstream from bridge on County Road 6, 1.6 mi upstream from mouth, and 3.1 mi north of Henderson.

DRAINAGE AREA.--237 mi^2.

PERIOD OF RECORD.--October 1973 to current year. May 1970 to September 1973, operated as a low-flow station only.

GAGE.--Water-stage recorder. Datum of gage is 728.56 ft above National Geodetic Vertical Datum of 1929.

REMARKS.--Records good except those for estimated daily discharges and period Sept. 3-16, which are fair.

AVERAGE DISCHARGE.--14 years, 94.8 ft^3/s, 5.43 in/yr, 68,680 acre-ft/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 1,760 ft^3/s, Aug. 25, 1981, gage height, 9.09 ft; minimum discharge, 0.20 ft^3/s, Jan. 4, 1981, result of freezeup.

EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 300 ft^3/s and maximum (*):

Date	Time	Discharge (ft^3/s)	Gage height (ft)	Date	Time	Discharge (ft^3/s)	Gage height (ft)
Oct. 1	0245	*599	*4.19	July 17	0545	226	2.39

(occurred on recession following peak of Sept. 21, 1986)

(maximum independent peak)
No other peak greater than base discharge.

Minimum discharge, 3.2 ft^3/s, Sept. 16, gage height, 0.73 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	579	85	67	24	e10	22	61	18	15	55	28	5.0
2	524	87	67	23	e10	22	58	18	16	44	26	4.4
3	441	84	63	23	9.5	22	54	17	16	34	24	4.0
4	371	77	e45	23	9.0	25	48	15	14	29	23	3.9
5	309	76	e43	23	9.1	30	45	15	13	28	22	3.9
6	260	76	e42	23	9.3	38	43	16	13	28	19	3.9
7	233	72	e42	23	10	48	43	15	11	23	17	3.7
8	212	80	e41	23	12	47	43	15	9.9	20	15	3.7
9	190	68	e40	22	13	33	44	15	8.9	19	20	3.5
10	173	e54	e38	21	13	28	45	14	11	19	16	3.5
11	161	e55	e35	20	13	35	43	12	9.8	22	16	3.5
12	184	e56	32	20	13	36	40	9.9	8.8	38	22	3.9
13	198	56	29	20	14	36	38	10	8.3	39	16	4.2
14	191	58	27	20	14	35	37	11	7.8	67	13	3.5
15	185	58	25	e19	15	30	38	11	8.2	144	13	3.7
16	189	58	25	e18	15	26	38	9.4	8.4	200	14	6.4
17	173	59	26	17	15	24	42	8.9	11	220	15	13
18	151	57	26	e16	15	23	39	9.2	13	189	14	7.6
19	150	e57	26	15	16	24	32	9.2	10	117	12	8.1
20	144	e56	26	e15	16	26	29	9.2	9.9	74	9.9	10
21	135	e56	26	e14	15	26	29	12	12	63	9.6	11
22	139	56	25	e14	16	29	27	13	17	51	11	12
23	126	56	25	e13	17	32	30	12	42	42	7.3	11
24	124	e57	25	e13	18	34	27	10	66	35	8.2	11
25	121	58	25	e12	18	36	23	11	104	34	6.3	10
26	116	60	25	e12	19	48	21	13	161	33	5.9	9.3
27	108	62	24	e11	19	55	20	13	189	38	5.7	7.4
28	97	65	24	e11	21	64	22	13	172	38	6.7	6.8
29	106	66	24	e11	---	59	23	13	122	34	6.1	5.9
30	102	67	24	e11	---	59	20	13	79	33	5.2	5.6
31	90	---	24	e11	---	57	---	13	---	31	5.3	---
TOTAL	6282	1932	1036	541	393.9	1111	1102	393.8	1187.0	1841	432.2	193.4
MEAN	203	64.4	33.4	17.5	14.1	35.8	36.7	12.7	39.6	59.4	13.9	6.45
MAX	579	87	67	24	21	64	61	18	189	220	28	13
MIN	90	54	24	11	9.0	22	20	8.9	7.8	19	5.2	3.5
AC-FT	12460	3830	2050	1070	781	2200	2190	781	2350	3650	857	384
CFSM	.86	.27	.14	.07	.06	.15	.15	.05	.17	.25	.06	.03
IN.	.99	.30	.16	.08	.06	.17	.17	.06	.19	.29	.07	.03

CAL YR 1986 TOTAL 82604.4 MEAN 226 MAX 1580 MIN 8.2 AC-FT 163800 CFSM .95 IN. 12.97
WTR YR 1987 TOTAL 16455.3 MEAN 45.1 MAX 579 MIN 3.5 AC-FT 32640 CFSM .19 IN. 2.58

e Estimated

MINNESOTA RIVER BASIN

05330000 MINNESOTA RIVER NEAR JORDAN, MN

LOCATION.--Lat 44°41'35", long 93°38'30", in NW¼SW¼ sec.7, T.114 N., R.23 W., Carver County, Hydrologic Unit 07020012, on pier at center downstream side of bridge, 1.5 mi northwest of Jordan, and at mile 39.4 upstream from Mississippi River.

DRAINAGE AREA.--16,200 mi^2, approximately.

WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--September 1934 to current year. Prior to Oct. 1, 1966, published as "near Carver, Minn".

REVISED RECORDS.--WSP 955: Drainage area. WSP 1508: 1935.

GAGE.--Water-stage recorder. Datum of gage is 690.00 ft above National Geodetic Vertical Datum of 1929. Prior to Oct. 1, 1966, water-stage recorder 2.8 mi downstream with auxiliary nonrecording gage at present site and present datum.

REMARKS.--Records good except those for Dec. 10 to Mar. 3, which are fair.

AVERAGE DISCHARGE.--53 years, 3,823 ft^3/s, 3.20 in/yr, 2,770,000 acre-ft/yr; median of yearly mean discharges, 3,370 ft^3/s, 2.82 in/yr, 2,440,000 acre-ft/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 117,000 ft^3/s, Apr. 11, 1965; maximum gage height, 35.07 ft, Apr. 12, 1965 (backwater from Mississippi River); minimum discharge, 79 ft^3/s, Nov. 17, 1955; minimum gage height, 2.66 ft, Nov. 22, 1935.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 23,900 ft^3/s, Oct. 1, gage height, 24.13 ft, occurred on recession following peak of Sept. 29, 1986; maximum independent peak discharge, 9,270 ft^3/s, Apr. 1, gage height, 14.28 ft; minimum discharge, 605 ft^3/s, Sept. 30, gage height, 4.13 ft.

REVISIONS.--Revised 1976 calendar year summary is given below. These figures supersede those published in the report for 1977.

CAL YR 1976 TOTAL 337827 MEAN 923 MAX 5470 MIN 152 AC-FT 670100 CFSM .06 IN. .78

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	23300	8700	5740	e3100	e1700	e2600	9220	4430	4140	2290	1940	908
2	21800	8500	5780	e3050	e1700	e2700	9090	4370	4160	2080	1810	891
3	20600	8430	5770	e2950	e1700	e2800	8970	4290	4300	1930	1630	847
4	19500	8260	5560	e2900	e1750	2950	8750	4230	4430	1820	1520	867
5	18500	8140	5650	e2850	e1750	3120	8400	4080	4490	1730	1490	878
6	17600	8100	5300	e2800	e1750	3270	7980	3740	4320	1690	1400	817
7	16600	7900	5110	e2750	e1800	3420	7490	3540	4080	1700	1480	769
8	15700	7920	4950	e2750	e1800	3590	7230	3410	3760	1690	1720	739
9	15000	7820	4960	e2700	e1800	3660	6990	3210	3550	1700	1760	714
10	14200	7600	e4800	e2650	e1850	3720	6760	3130	3370	1700	1610	700
11	13200	7480	e4700	e2600	e1850	3760	6560	2960	2960	1790	1430	680
12	12500	7190	e4650	e2600	e1900	3720	6360	2790	2730	1900	1540	685
13	12300	6510	e4550	e2550	e1900	3650	6310	2680	2630	1970	1900	678
14	12600	5760	e4500	e2450	e1950	3580	6270	2580	2540	2170	1970	673
15	13100	5530	e4400	e2400	e1950	3540	6150	2450	2290	2830	1850	656
16	13600	5500	e4300	e2350	e2000	3530	6210	2380	2200	4060	1580	675
17	14000	5750	e4200	e2300	e2000	3480	6160	2310	2330	4420	1450	716
18	14100	5830	e4100	e2150	e2000	3490	6130	2230	2240	4150	1490	697
19	13800	5810	e4050	e2050	e2050	3520	6110	2190	2060	3770	1510	709
20	13000	5940	e4000	e1950	e2100	3580	6040	2180	2130	3330	1450	727
21	12200	5880	e4000	e1850	e2150	3610	5950	2150	2560	3100	1460	721
22	11500	6310	e3950	e1800	e2150	3700	5830	2110	2860	2710	1470	725
23	11000	6150	e3850	e1750	e2200	3750	5620	2160	2980	2490	1420	735
24	10500	6000	e3750	e1750	e2250	3890	5450	2210	3200	2430	1280	734
25	10100	5870	e3650	e1700	e2350	4220	5290	2490	3670	2540	1200	721
26	9850	5710	e3600	e1650	e2400	5400	5110	2860	3680	2830	1220	709
27	9600	5580	e3550	e1650	e2450	6830	4970	3000	3430	2830	1170	701
28	9310	5620	e3450	e1650	e2550	7840	4870	3090	3120	2810	1060	683
29	9020	5660	e3350	e1650	---	8530	4740	3380	2860	2480	1010	639
30	8930	5750	e3250	e1650	---	8960	4600	3830	2560	2270	984	611
31	8880	---	e3150	e1700	---	9210	---	4080	---	2050	943	---
TOTAL	425890	201200	136620	70700	55800	133620	195610	94540	95630	77260	45747	22005
MEAN	13740	6707	4407	2281	1993	4310	6520	3050	3188	2492	1476	733
MAX	23300	8700	5780	3100	2550	9210	9220	4430	4490	4420	1970	908
MIN	8880	5500	3150	1650	1700	2600	4600	2110	2060	1690	943	611
AC-FT	844800	399100	271000	140200	110700	265000	388000	187500	189700	153200	90740	43650
CFSM	.85	.41	.27	.14	.12	.27	.40	.19	.20	.15	.09	.05
IN.	.98	.46	.31	.16	.13	.31	.45	.22	.22	.18	.11	.05

CAL YR 1986 TOTAL 4169350 MEAN 11420 MAX 36600 MIN 1370 AC-FT 8270000 CFSM .71 IN. 9.57
WTR YR 1987 TOTAL 1554622 MEAN 4259 MAX 23300 MIN 611 AC-FT 3084000 CFSM .26 IN. 3.57

e Estimated

05330000 MINNESOTA RIVER NEAR JORDAN, MN--Continued
(National stream-quality accounting network)

WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1952, 1963-69, 1972 to current year.

REMARKS.--Letter K indicates non-ideal colony count.

WATER QUALITY DATA, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (CFS) (00061)	SPE-CIFIC CON-DUCT-ANCE (US/CM) (00095)	SPE-CIFIC CON-DUCT-ANCE LAB (US/CM) (90095)	PH (STAND-ARD UNITS) (00400)	PH LAB (STAND-ARD UNITS) (00403)	TEMPER-ATURE AIR (DEG C) (00020)	TEMPER-ATURE WATER (DEG C) (00010)	TUR-BID-ITY (NTU) (00076)	BARO-METRIC PRES-SURE (MM OF HG) (00025)	OXYGEN, DIS-SOLVED (MG/L) (00300)	COLI-FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML) (31625)
DEC 18...	1330	4080	1040	936	8.1	8.3	--	1.0	5.7	770	15.8	130
JAN 13...	1330	2510	978	1040	8.1	8.0	--	0.5	5.6	762	15.7	120
APR 28...	1240	4880	861	991	8.1	8.1	23.0	16.0	17	770	9.8	--
JUL 20...	1530	3270	879	898	8.0	8.4	30.0	27.5	17	768	7.9	110

DATE	STREP-TOCOCCI FECAL, KF AGAR (COLS. PER 100 ML) (31673)	CALCIUM DIS-SOLVED (MG/L AS CA) (00915)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG) (00925)	SODIUM, DIS-SOLVED (MG/L AS NA) (00930)	POTAS-SIUM, DIS-SOLVED (MG/L AS K) (00935)	ALKA-LINITY WATER DISSOLV FLD. AS CACO3 (MG/L) (39086)	CAR-BONATE WATER DISSOLV FIELD AS CO3 (MG/L) (00452)	BICAR-BONATE WATER DISSOLV FIELD AS HCO3 (MG/L) (00453)	SULFATE DIS-SOLVED (MG/L AS SO4) (00945)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL) (00940)	FLUO-RIDE, DIS-SOLVED (MG/L AS F) (00950)
DEC 18...	54	140	64	26	4.9	374	0	456	230	29	0.4
JAN 13...	100	130	56	27	4.7	344	0	420	180	28	0.3
APR 28...	--	100	60	26	4.4	230	10	261	260	41	0.4
JUL 20...	160	110	48	22	4.4	268	23	281	110	24	0.1

DATE	SILICA, DIS-SOLVED (MG/L AS SIO2) (00955)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L) (70300)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N) (00631)	NITRO-GEN, AMMONIA DIS-SOLVED (MG/L AS N) (00608)	NITRO-GEN,AM-MONIA + ORGANIC TOTAL (MG/L AS N) (00625)	PHOS-PHORUS, TOTAL (MG/L AS P) (00665)	PHOS-PHORUS, DIS-SOLVED (MG/L AS P) (00666)	PHOS-PHORUS, ORTHO, DIS-SOLVED (MG/L AS P) (00671)	SEDI-MENT, SUS-PENDED (MG/L) (80154)	SEDI-MENT, DIS-CHARGE, SUS-PENDED (T/DAY) (80155)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM (70331)
DEC 18...	22	704	6.2	0.03	1.0	0.07	0.03	0.03	--	--	--
JAN 13...	20	678	3.6	0.06	0.90	0.14	0.03	0.03	124	840	43
APR 28...	5.9	647	2.6	0.01	0.70	0.19	0.04	0.02	161	2120	93
JUL 20...	25	598	5.6	0.06	2.9	0.26	0.10	0.08	234	2070	92

05330000 MINNESOTA RIVER NEAR JORDAN, MN--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	TIME	ALUMINUM, DISSOLVED (UG/L AS AL) (01106)	ARSENIC DISSOLVED (UG/L AS AS) (01000)	BARIUM, DISSOLVED (UG/L AS BA) (01005)	BERYLLIUM, DISSOLVED (UG/L AS BE) (01010)	CADMIUM DISSOLVED (UG/L AS CD) (01025)	CHROMIUM, DISSOLVED (UG/L AS CR) (01030)	COBALT, DISSOLVED (UG/L AS CO) (01035)	COPPER, DISSOLVED (UG/L AS CU) (01040)	IRON, DISSOLVED (UG/L AS FE) (01046)	LEAD, DISSOLVED (UG/L AS PB) (01049)
DEC 18...	1330	<10	2	85	<0.5	<1	<1	<3	5	10	<5
JAN 13...	1330	<10	2	78	<0.5	<1	<1	<3	2	10	<5
APR 28...	1240	20	1	66	<0.5	<1	<1	<3	1	<3	<5
JUL 20...	1530	<10	5	82	<0.5	<1	<1	<3	3	3	<5

DATE	LITHIUM DISSOLVED (UG/L AS LI) (01130)	MANGANESE, DISSOLVED (UG/L AS MN) (01056)	MERCURY DISSOLVED (UG/L AS HG) (71890)	MOLYBDENUM, DISSOLVED (UG/L AS MO) (01060)	NICKEL, DISSOLVED (UG/L AS NI) (01065)	SELENIUM, DISSOLVED (UG/L AS SE) (01145)	SILVER, DISSOLVED (UG/L AS AG) (01075)	STRONTIUM, DISSOLVED (UG/L AS SR) (01080)	VANADIUM, DISSOLVED (UG/L AS V) (01085)	ZINC, DISSOLVED (UG/L AS ZN) (01090)
DEC 18...	55	35	0.1	<10	2	3	<1	470	<6	13
JAN 13...	50	95	0.2	<10	1	2	<1	440	<6	20
APR 28...	51	2	0.3	<10	2	2	<1	430	<6	9
JUL 20...	52	1	1.8	<10	1	4	<1	400	7	11

RADIOCHEMICAL ANALYSES, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	TIME	GROSS ALPHA, DISSOLVED (UG/L AS U-NAT) (80030)	GROSS ALPHA, SUSP. TOTAL (UG/L AS U-NAT) (80040)	GROSS BETA, DISSOLVED (PCI/L AS CS-137) (03515)	GROSS BETA, SUSP. TOTAL (PCI/L AS CS-137) (03516)	GROSS BETA, DISSOLVED (PCI/L AS SR/YT-90) (80050)	GROSS BETA, SUSP. TOTAL (PCI/L AS SR/YT-90) (80060)	RADIUM 226, DISSOLVED, RADON METHOD (PCI/L) (09511)
DEC 18...	1330	21	<0.4	10	2.3	7.3	2.3	0.02
APR 28...	1240	14	<0.4	6.3	0.6	4.6	0.6	0.08
JUL 20...	1530	22	4.2	8.7	6.0	6.0	5.3	0.14

MISSISSIPPI RIVER MAIN STEM

05331000 MISSISSIPPI RIVER AT ST. PAUL, MN

LOCATION.--Lat 44°56'40", long 93°05'20", in SE¼NE¼ sec.6, T.28 N., R.22 W., Ramsey County, Hydrologic Unit 07010206, on left bank in St. Paul, 300 ft upstream from Robert Street Bridge, 6 mi downstream from Minnesota River, and at mile 839.3 upstream from Ohio River.

DRAINAGE AREA.--36,800 mi^2, approximately.

WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--Water year 1867-69, 1872-92 (annual maximums), March 1892 to current year (prior to 1901, fragmentary during some winters). Records prior to March 1892, published in the 19th Annual Report, Part 4, have been found to be unreliable and should not be used. Monthly discharge only for some periods, published in WSP 1308. Gage-height records (winter records incomplete) collected at same site since 1866 are contained in reports of U.S. Weather Bureau, War Department and Mississippi River Commission.

REVISED RECORDS.--WSP 285: 1892-96. WSP 715: Drainage area. WSP 875: 1938. WSP 895: 1939. WSP 1308: 1867(M). WSP 1508: 1897, 1898(M), 1903(M), 1917-18(M), 1928(M), 1929. WRD MN-74: 1973.

GAGE.--Water-stage recorder. Datum of gage is 683.62 ft above National Geodetic Vertical Datum of 1929. Prior to Mar. 18, 1925, nonrecording gage at several sites within 300 ft of present site at present datum. Mar. 18, 1925, to Mar. 10, 1933, water-stage recorder and Mar. 11, 1933, to Sept. 14, 1939, nonrecording gage, at present site and datum. Since September 1936, auxiliary water-stage recorder 5.6 mi downstream.

REMARKS.--Records good except those for July 25-27, which are fair. Slight regulation except during extreme floods by reservoirs on headwaters and by power plants. Beginning July 20, 1938, sewage from Minneapolis and St. Paul, which formerly entered above station, was diverted to a sewage-disposal plant, thence to river below station. Figures of daily discharge do not include this diversion.

COOPERATION.--Records of Mississippi River at Twin City lock and dam computed and furnished by Ford Motor Co. Diversion through sewage disposal plant furnished by Metropolitan Waste Control Commission.

AVERAGE DISCHARGE (ADJUSTED FOR DIVERSION).--89 years (water years 1895, 1897, 1901-87), 11,259 ft^3/s, 4.15 in/yr; median of yearly mean discharges, 10,170 ft^3/s, 3.75 in/yr.

EXTREMES FOR PERIOD OF RECORD (1867-70, 1872-1986).--Maximum discharge, 171,000 ft^3/s, Apr. 16, 1965, gage height, 26.01 ft, from floodmark. Maximum flood known since at least 1851, that of 1965. Flood of Apr. 11, 1870 reached a stage of 19.4 ft, discharge, 100,000 ft^3/s.

EXTREMES FOR PERIOD OF RECORD (1897,1917-87).--Minimum daily discharge, 632 ft^3/s, Aug. 26, 1934.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 63,300 ft^3/s, Oct. 1, gage height, 12.70 ft, was not independent of the same peak discharge that occurred Sept 30, 1986; maximum independent peak discharge, 30,300 ft^3/s, July 24, gage height, 6.56 ft; minimum daily, 3,590 ft^3/s, Sept. 17.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	62800	23600	17300	12700	8810	9430	22500	9930	19100	7000	9200	4730
2	61700	23100	17100	12200	9110	9670	21800	9900	18900	6490	9590	4790
3	59900	22400	17500	12500	9820	9560	21700	10200	18900	5970	9520	4700
4	57600	22700	17400	12300	8700	9480	20500	10200	17800	6050	9340	4940
5	55100	22000	16100	11800	9160	9700	19900	9890	17800	5680	8700	3980
6	51800	21900	15000	12100	9080	9840	18600	9300	16300	5440	8500	4060
7	49100	21700	15100	12000	9410	10500	18600	9130	16300	5060	7750	4580
8	46700	22200	14600	11900	8650	10800	17700	8970	14200	4920	7540	4130
9	44500	21300	15300	11300	8480	11800	17100	8470	13500	4850	7280	4110
10	42300	20900	14500	11400	8380	12400	17000	8250	12900	4740	7440	4170
11	40500	20300	13100	11000	8610	12000	16500	7660	11900	4890	7020	4230
12	38400	18800	12400	11900	8750	12200	16100	7700	11200	4860	6480	3850
13	36400	16600	10200	11900	8600	12400	15700	7680	10600	5100	6390	4050
14	35400	15200	10600	11600	8780	12400	15700	6770	10200	4910	6540	3600
15	34700	16500	14100	10700	9020	12200	15600	6540	9730	5180	6650	3700
16	34900	15700	15100	9440	8200	12000	15200	6580	9010	5310	6160	3680
17	34100	17400	15100	8830	9010	11600	15100	6530	8410	6770	7450	3590
18	34000	17800	14400	9720	9130	11200	15200	6370	8260	7700	6890	3820
19	33400	17300	14800	10000	9030	11100	14700	5980	7910	6980	6310	4380
20	33100	16500	14100	9580	8650	11300	14500	6550	7580	7080	5930	4020
21	31300	17100	13800	9520	8790	11100	14200	6540	7440	6890	6200	4620
22	30200	16500	13900	9450	8790	11000	14100	6880	7020	7210	6590	5060
23	29400	17900	13900	6840	8950	11300	13400	8070	6630	8920	5830	5040
24	28200	17600	13800	6920	8840	12400	13000	9390	7460	23700	5780	5320
25	27300	17500	14000	7810	8860	13200	12500	12000	7940	e13000	5410	4730
26	26100	17100	13400	7950	9000	14600	11900	13200	7420	e11800	5350	5110
27	25900	17300	13300	8730	9110	17800	11900	15200	7910	e10600	5680	5370
28	25500	17000	13100	9880	9220	20400	11400	16700	7770	9590	5440	4780
29	24600	17000	13500	9260	---	21500	11100	17600	7430	9220	5270	4820
30	24400	17200	13000	9310	---	22400	10600	18000	7430	9400	5040	5510
31	24600	---	12900	8720	---	22200	---	18600	---	9320	5010	---
TOTAL	1184500	566100	442400	319260	248950	399480	473800	304780	334950	234630	212280	133470
MEAN	38210	18870	14270	10300	8891	12890	15790	9832	11160	7569	6848	4449
MAX	62800	23600	17500	12700	9820	22400	22500	18600	19100	23700	9580	5510
MIN	24400	15200	10200	6840	8200	9430	10600	5980	6630	4740	5010	3590
CFSM	1.04	.51	.39	.28	.24	.35	.43	.27	.30	.21	.19	.12
IN.	1.20	.57	.45	.32	.25	.40	.48	.31	.34	.24	.21	.13
$	335	293	312	279	282	288	281	279	293	398	384	308
MEAN ¥	38540	19160	14580	10580	9173	13180	16070	10110	11450	7967	7232	4757
CFSM ¥	105	.52	.40	.29	.25	.36	.44	.27	.31	.22	.20	.13
IN. ¥	1.21	.58	.46	.33	.26	.41	.49	.32	.35	.25	.23	.14

CAL YR 1986 TOTAL 11268750 MEAN 30870 MAX 83000 MIN 7140 MEAN ¥ 31,231 CFSM ¥ .85 IN ¥ 11.52
WTR YR 1987 TOTAL 4854600 MEAN 13300 MAX 62800 MIN 3590 MEAN ¥ 13,611 CFSM ¥ .37 IN ¥ 5.02

$ Diversion equivalent in cubic feet per second, through sewage disposal plant.
¥ Adjusted for diversion.
e Estimated

MISSISSIPPI RIVER BASIN

05331000 MISSISSIPPI RIVER AT ST. PAUL, MN--Continued

WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1956 to current year.

PERIOD OF DAILY RECORD.--
WATER TEMPERATURES: October 1956 to current year.

INSTRUMENTATION.--Temperature recorder since October 1956.

EXTREMES FOR PERIOD OF DAILY RECORD.--
WATER TEMPERATURES: Maximum 31.0°C July 24-28, 1964, July 31, 1975, July 19, 21, 1977; minimum, 0.0°C many days during winter periods.

EXTREMES FOR CURRENT YEAR.--
WATER TEMPERATURES: Maximum recorded, 27.5°C, July 10, 11, but may have been higher during the period of no temperature record July 22 to Aug. 6; minimum, 0.0°C many days during winter period.

WATER TEMPERATURE, DEGREES CENTIGRADE, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		OCTOBER			NOVEMBER			DECEMBER			JANUARY	
1	18.0	17.5	17.5	10.5	10.0	10.5	1.5	1.0	1.0	.5	.0	.5
2	17.5	17.0	17.0	10.5	8.5	10.0	1.5	1.0	1.5	.0	.0	.0
3	17.0	16.0	16.5	10.0	8.0	9.0	1.5	1.0	1.5	.0	.0	.0
4	16.0	15.5	15.5	9.5	8.0	9.0	1.0	1.0	1.0	.5	.0	.0
5	15.5	15.0	15.0	9.0	6.5	8.0	1.0	.5	.5	1.0	.5	.5
6	15.0	14.5	14.5	9.0	6.0	8.0	.5	.0	.0	1.0	.5	1.0
7	14.5	14.0	14.5	8.0	5.5	6.5	.5	.0	.0	1.5	1.0	1.0
8	14.5	14.0	14.5	8.0	6.0	7.0	.5	.0	.5	1.5	1.5	1.5
9	14.0	13.5	13.5	7.0	5.0	6.5	.5	.5	.5	1.5	1.0	1.5
10	13.5	12.5	13.0	6.5	4.0	5.5	1.0	.5	.5	1.0	.0	.5
11	12.5	11.5	12.0	6.0	3.0	5.0	1.0	.5	.5	.5	.0	.0
12	11.5	10.5	11.0	5.5	2.0	4.0	.5	.5	.5	.5	.0	.5
13	10.5	10.5	10.5	5.5	2.0	4.0	.5	.5	.5	.5	.0	.0
14	10.5	10.0	10.0	4.5	1.0	3.5	.5	.5	.5	.5	.0	.5
15	10.0	9.5	10.0	4.0	.5	3.0	.5	.5	.5	.5	.5	.5
16	10.0	9.0	9.5	3.5	1.0	2.0	.5	.5	.5	.5	.0	.5
17	10.0	9.5	10.0	3.5	.5	1.5	1.0	.5	.5	.5	.5	.5
18	10.0	9.5	10.0	1.5	.0	.5	1.0	.5	.5	.5	.5	.5
19	10.5	10.0	10.0	2.0	.0	1.0	.5	.0	.5	.5	.0	.5
20	12.0	10.5	11.0	2.0	.0	1.0	.0	.0	.0	.5	.0	.0
21	12.5	11.5	12.0	2.0	.0	1.5	.5	.0	.0	.5	.0	.0
22	13.0	12.0	12.5	.5	.0	.0	1.0	.0	.5	.5	.5	.5
23	13.5	12.5	13.0	.5	.5	.5	.0	.0	.0	1.0	.5	1.0
24	13.0	12.5	13.0	1.5	.5	1.0	.0	.0	.0	1.0	.5	1.0
25	12.5	12.0	12.5	1.5	.5	1.0	.0	.0	.0	1.0	.5	.5
26	12.5	12.0	12.5	2.0	1.5	1.5	.5	.0	.0	1.0	.5	1.0
27	12.5	12.0	12.5	1.5	1.0	1.5	.0	.0	.0	1.0	.5	1.0
28	12.0	12.0	12.0	1.5	1.0	1.5	.5	.0	.0	.5	.5	.5
29	11.5	11.5	11.5	1.5	1.5	1.5	.5	.0	.0	.5	.0	.0
30	11.0	11.0	11.0	1.5	1.0	1.0	.5	.5	.5	.5	.0	.0
31	11.0	10.5	11.0	---	---	---	.5	.5	.5	.0	.0	.0
MONTH	18.0	9.0	12.5	10.5	.0	3.9	1.5	.0	.4	1.5	.0	.5

05331000 MISSISSIPPI RIVER AT ST. PAUL, MN..Continued

WATER TEMPERATURE, DEGREES CENTIGRADE, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		FEBRUARY			MARCH			APRIL			MAY	
1	.5	.0	.0	2.0	1.5	1.5	5.0	4.5	4.5	17.5	17.0	17.5
2	.0	.0	.0	2.5	1.5	2.0	5.0	4.5	4.5	17.0	16.0	16.5
3	.5	.0	.0	2.5	1.5	2.0	5.5	4.5	5.0	16.5	15.5	16.0
4	1.0	.0	.5	3.0	2.0	2.5	6.0	5.0	5.5	17.5	16.0	16.5
5	1.0	1.0	1.0	3.5	2.5	3.0	7.0	5.5	6.0	18.0	16.5	17.0
6	1.5	1.0	1.0	4.5	3.0	3.5	8.5	7.0	7.5	18.5	17.0	17.5
7	1.5	1.0	1.5	5.5	3.5	4.5	10.0	8.5	9.5	19.5	17.5	18.5
8	1.5	1.0	1.0	5.5	5.0	5.5	11.5	10.0	10.5	20.0	18.5	19.0
9	1.0	.5	1.0	5.5	3.5	4.5	12.5	11.0	12.0	20.5	19.0	20.0
10	1.5	1.0	1.0	3.0	2.0	2.5	13.5	12.0	12.5	21.5	20.5	21.0
11	2.0	1.5	1.5	1.5	1.5	1.5	13.0	12.5	12.5	22.0	21.0	21.5
12	2.5	2.0	2.0	2.5	1.5	2.0	13.0	12.5	12.5	22.0	21.5	22.0
13	3.0	2.0	2.5	2.5	2.5	2.5	13.5	13.0	13.0	22.0	21.0	21.5
14	2.5	2.0	2.5	2.5	2.0	2.0	13.5	13.0	13.5	21.0	20.5	21.0
15	2.0	1.0	1.5	2.5	2.0	2.0	13.5	13.0	13.0	21.5	20.5	21.0
16	1.0	.5	1.0	2.5	2.0	2.0	14.0	13.0	13.5	21.5	20.5	21.0
17	1.0	.5	1.0	2.5	2.0	2.5	15.0	13.5	14.5	22.0	21.0	21.5
18	1.5	1.0	1.0	2.5	2.5	2.5	16.0	14.5	15.5	22.0	20.5	21.5
19	1.5	.5	1.0	3.0	2.5	2.5	17.0	15.5	16.5	21.0	20.5	20.5
20	1.5	.5	1.0	3.5	2.5	3.0	18.0	17.0	17.5	20.5	20.0	20.0
21	2.5	1.5	2.0	4.0	3.0	3.5	18.0	17.0	17.5	20.0	19.5	20.0
22	2.5	2.0	2.0	4.5	3.5	4.0	17.0	15.5	16.0	20.0	19.0	19.5
23	2.5	2.0	2.0	5.5	4.5	5.0	15.5	15.0	15.5	19.5	18.5	19.0
24	2.0	1.5	2.0	6.5	5.5	6.0	16.0	15.5	15.5	18.5	18.0	18.5
25	2.0	1.5	1.5	6.5	6.0	6.0	15.5	15.5	15.5	18.0	17.5	18.0
26	2.5	1.5	2.0	6.5	5.0	6.0	16.5	15.0	16.0	19.0	17.5	18.0
27	2.5	1.5	2.0	5.0	5.0	5.0	17.5	16.5	17.0	20.0	18.5	19.0
28	2.5	2.0	2.5	5.0	5.0	5.0	17.5	16.5	17.0	20.5	20.0	20.5
29	---	---	---	5.0	5.0	5.0	17.5	17.0	17.5	21.0	20.5	20.5
30	---	---	---	5.0	5.0	5.0	18.0	16.5	17.5	21.5	20.5	20.5
31	---	---	---	5.0	5.0	5.0	---	---	---	22.5	21.5	22.0
MONTH	3.0	.0	1.4	6.5	1.5	3.5	18.0	4.5	12.8	22.5	15.5	19.6

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		JUNE			JULY			AUGUST			SEPTEMBER	
1	23.0	22.5	22.5	24.5	23.5	24.0	---	---	---	21.5	21.0	21.5
2	23.0	22.5	23.0	24.5	24.0	24.5	---	---	---	21.5	21.0	21.5
3	22.5	21.5	22.0	24.5	24.0	24.5	---	---	---	22.0	21.0	21.5
4	21.5	21.0	21.0	25.0	24.0	24.5	---	---	---	21.5	20.5	21.0
5	22.0	21.0	21.5	24.5	24.0	24.5	---	---	---	22.0	21.5	21.5
6	23.0	22.0	22.0	25.0	24.0	24.5	---	---	---	22.5	21.5	22.0
7	23.5	22.5	23.0	25.0	24.5	25.0	26.0	26.0	26.0	23.0	22.0	22.5
8	24.0	23.5	23.5	26.0	24.5	25.0	26.0	26.0	26.0	23.5	22.0	23.0
9	24.0	23.0	23.5	27.0	25.5	26.0	26.0	26.0	26.0	23.5	22.5	23.0
10	23.5	22.0	23.0	27.5	26.5	27.0	26.0	26.0	26.0	23.0	21.5	22.0
11	22.0	21.5	21.5	27.5	26.5	26.5	26.0	25.5	26.0	21.5	21.0	21.5
12	23.5	22.0	22.5	26.5	26.5	26.5	25.5	25.5	25.5	21.5	20.5	21.0
13	25.0	23.5	24.0	26.5	26.5	26.5	25.5	25.5	25.5	21.0	20.5	20.5
14	26.0	25.0	25.5	26.5	26.5	26.5	25.5	25.5	25.5	20.5	20.0	20.5
15	26.5	25.0	26.0	26.5	26.5	26.5	25.5	25.5	25.5	20.5	20.0	20.0
16	27.0	25.5	26.5	26.5	26.5	26.5	25.5	25.5	25.5	20.5	20.5	20.5
17	26.5	25.5	26.0	26.5	26.5	26.5	25.5	25.5	25.5	20.5	19.5	20.0
18	26.5	25.0	25.5	26.5	26.5	26.5	25.5	24.5	25.0	20.0	19.5	20.0
19	27.0	25.5	26.0	26.5	26.5	26.5	25.5	24.0	25.0	19.5	19.0	19.5
20	27.0	26.0	26.5	26.5	26.0	26.5	25.0	24.0	24.5	19.0	18.5	19.0
21	27.0	26.0	26.5	26.0	26.0	26.0	25.0	24.0	24.5	18.5	18.0	18.5
22	27.0	26.5	26.5	---	---	---	24.5	23.5	24.0	18.5	18.0	18.5
23	27.0	26.0	26.5	---	---	---	24.0	23.0	23.5	18.5	18.0	18.5
24	26.5	26.5	26.5	---	---	---	23.0	22.5	22.5	19.0	18.5	19.0
25	26.5	25.5	26.0	---	---	---	22.5	21.5	22.0	19.5	19.0	19.0
26	26.0	24.5	25.0	---	---	---	21.5	20.5	21.0	19.5	19.0	19.0
27	24.0	23.5	23.5	---	---	---	21.0	20.5	20.5	20.0	19.0	19.5
28	23.5	23.0	23.0	---	---	---	21.0	20.5	20.5	20.5	20.0	20.0
29	23.0	22.5	23.0	---	---	---	21.0	20.0	20.5	20.5	19.5	20.0
30	23.5	23.0	23.5	---	---	---	20.5	20.5	20.5	20.0	19.5	19.5
31	---	---	---	---	---	---	21.5	20.0	21.0	---	---	---
MONTH	27.0	21.0	24.2	---	---	---	---	---	---	23.5	18.0	20.4

MISSISSIPPI RIVER MAIN STEM

05331545 MISSISSIPPI RIVER AT FIFTH STREET AT NEWPORT, MN

WATER-QUALITY RECORDS

LOCATION.--Lat 44°51'37", long 93°00'24", in NE¼NE¼ sec.2, T.27 N., R.22 W., Washington County, Hydrologic Unit 07010206, on left bank at the end of Fifth Street, and at mile 830.6 upstream from Ohio River.

PERIOD OF RECORD.--December 1978 to current year.

PERIOD OF DAILY RECORD.--
SPECIFIC CONDUCTANCE: December 1978 to current year.
pH: December 1978 to current year.
WATER TEMPERATURES: December 1978 to current year.
DISSOLVED OXYGEN: December 1978 to current year.

INSTRUMENTATION.--Water-quality monitor since December 1978.

REMARKS.-Water is pumped to a monitor that is inside a heated shelter. Extremes are published for those years with 80 percent or more daily record.

COOPERATION.--Water-quality monitor is operated by the Metropolitan Waste Control Commission, St. Paul, Minn.

EXTREMES FOR PERIOD OF DAILY RECORD.--
SPECIFIC CONDUCTANCE (water year 1981, 1983-87): Maximum, 823 microsiemens Apr. 10, 1987; minimum, 201 microsiemens Mar. 22, 1985.
pH (water year 1981, 1983-87): Maximum, 8.6 units Apr. 18, 1981, Sept. 17-18, 1984, Feb. 11, 1986; minimum, 7.2 units Sep. 25, 1984.
WATER TEMPERATURES (water year 1981, 1983-87): Maximum, 30.5°C Aug. 3, 1987; minimum, 0.0°C on many days during winter period.
DISSOLVED OXYGEN (water year 1981, 1983-85): Maximum, 15.7 mg/L Mar. 25, 1981; minimum, 3.4 mg/L June 6, 1984.

EXTREMES FOR CURRENT YEAR.--
SPECIFIC CONDUCTANCE: Maximum, 823 microsiemens Apr. 10; minimum, 374 microsiemens Aug. 9.
pH: Maximum, 8.5 units Apr. 20; minimum, 7.3 units Aug. 5.
WATER TEMPERATURES: Maximum, 30.5°C Aug. 3; minimum, 0.0°C on several days during winter period.

SPECIFIC CONDUCTANCE (MICROSIEMENS/CM AT 25 DEG. C), WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		OCTOBER			NOVEMBER			DECEMBER			JANUARY	
1	527	491	505	644	618	630	606	551	574	---	---	---
2	553	520	536	648	621	632	---	---	---	599	572	585
3	573	516	544	639	584	605	---	---	---	594	562	581
4	586	529	556	---	---	---	---	---	---	596	563	572
5	649	557	583	548	515	532	595	582	588	586	573	577
6	625	536	599	569	512	533	640	577	601	600	577	588
7	643	575	603	574	508	543	613	582	598	633	567	589
8	627	588	605	607	513	580	604	552	582	624	546	581
9	621	588	604	574	526	541	591	553	570	---	---	---
10	619	539	569	543	510	520	652	566	594	609	589	598
11	586	541	556	593	435	479	---	---	---	617	571	589
12	618	504	532	578	531	554	---	---	---	629	582	616
13	525	478	502	577	530	553	---	---	---	616	583	599
14	585	475	525	626	572	599	585	544	566	618	591	601
15	564	533	553	591	537	563	632	577	603	622	588	598
16	---	---	---	583	525	557	606	563	580	636	579	597
17	---	---	---	611	562	584	618	557	578	632	585	610
18	---	---	---	580	562	569	624	581	605	---	---	---
19	---	---	---	621	566	592	628	609	616	---	---	---
20	---	---	---	654	559	576	647	599	615	---	---	---
21	---	---	---	603	563	579	628	603	613	---	---	---
22	---	---	---	616	578	597	633	583	620	---	---	---
23	---	---	---	620	588	605	639	615	627	---	---	---
24	673	595	616	622	595	607	637	621	629	---	---	---
25	660	624	650	620	577	598	631	600	616	---	---	---
26	626	553	581	733	614	649	627	592	598	614	579	593
27	672	570	600	692	571	619	616	572	584	606	580	593
28	636	602	613	599	559	569	588	572	580	650	584	600
29	640	598	617	587	567	573	587	573	579	721	571	643
30	645	621	631	575	556	565	657	571	592	655	595	622
31	647	605	631	---	---	---	604	585	593	642	606	622

05331545 MISSISSIPPI RIVER AT FIFTH STREET AT NEWPORT, MN

SPECIFIC CONDUCTANCE (MICROSIEMENS/CM AT 25 DEG. C), WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		FEBRUARY			MARCH			APRIL			MAY	
1	673	631	646	---	---	---	712	648	676	707	619	672
2	670	582	619	---	---	---	702	642	677	716	581	643
3	624	550	588	---	---	---	704	667	691	656	583	617
4	627	504	526	610	523	582	739	693	717	675	541	609
5	534	505	518	662	598	631	759	712	735	690	598	626
6	566	493	528	633	593	608	784	726	750	678	599	650
7	584	545	565	632	599	616	750	693	717	691	599	630
8	550	534	541	649	612	628	774	695	740	706	591	641
9	587	515	558	646	521	606	790	737	779	714	614	664
10	610	539	598	610	504	535	823	622	703	669	600	635
11	638	598	614	548	507	525	676	636	651	644	545	595
12	608	581	595	564	504	536	690	652	666	645	565	602
13	---	---	---	598	512	547	679	618	651	632	568	589
14	---	---	---	567	546	555	679	629	657	660	581	604
15	---	---	---	535	536	551	700	636	663	713	580	640
16	---	---	---	577	538	552	766	630	673	621	518	577
17	---	---	---	590	545	558	761	699	731	602	539	571
18	578	544	560	589	555	568	750	648	701	634	520	573
19	567	521	548	596	575	585	721	608	670	644	553	595
20	580	527	558	600	558	576	732	641	682	644	579	597
21	560	543	550	580	558	568	733	584	649	651	570	606
22	570	507	545	628	551	582	634	574	605	690	490	583
23	550	490	528	582	540	557	650	526	587	593	470	520
24	566	510	525	597	543	568	659	560	600	---	---	---
25	---	---	---	586	537	558	663	591	642	---	---	---
26	---	---	---	577	528	547	682	594	658	---	---	---
27	---	---	---	588	520	555	689	606	634	523	458	485
28	---	---	---	644	566	599	662	565	614	---	---	---
29	---	---	---	644	596	615	638	580	606	---	---	---
30	---	---	---	672	609	642	661	577	602	---	---	---
31	---	---	---	675	580	632	---	---	---	---	---	---
MONTH	---	---	---	---	---	---	823	526	671	---	---	---

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		JUNE			JULY			AUGUST			SEPTEMBER	
1	---	---	---	671	536	599	559	500	528	549	469	506
2	---	---	---	625	495	577	542	480	508	669	477	543
3	---	---	---	669	524	608	487	426	456	614	505	531
4	577	471	506	630	525	552	470	397	418	---	---	---
5	559	475	522	628	515	571	469	442	455	---	---	---
6	583	518	548	642	606	622	520	432	446	---	---	---
7	593	501	552	631	518	565	487	441	467	601	533	557
8	624	532	563	653	585	624	495	440	464	615	501	546
9	629	526	568	690	597	648	480	374	436	---	---	---
10	652	513	577	686	601	633	490	360	422	---	---	---
11	674	534	614	608	510	545	521	466	491	611	537	563
12	636	570	591	---	---	---	538	478	507	595	537	556
13	615	549	585	602	576	589	509	476	488	674	525	600
14	610	538	559	629	574	593	515	424	480	533	484	512
15	619	548	583	703	601	632	577	431	480	639	477	530
16	639	597	604	742	615	685	604	485	539	557	518	539
17	670	576	630	647	561	618	505	425	458	626	509	551
18	656	581	609	676	606	635	---	---	---	553	504	535
19	637	553	605	618	532	561	---	---	---	629	507	581
20	629	567	581	690	565	603	475	420	448	565	532	542
21	663	594	635	619	590	605	522	458	482	590	532	562
22	648	596	621	720	628	674	495	429	459	655	566	601
23	756	648	695	---	---	---	---	---	---	596	540	569
24	745	638	695	---	---	---	---	---	---	637	563	595
25	704	649	670	---	---	---	---	---	---	613	543	570
26	772	655	722	---	---	---	560	492	526	618	530	558
27	709	659	688	534	481	504	546	514	529	603	530	554
28	703	630	673	496	444	462	635	512	533	594	518	554
29	670	402	552	634	467	561	532	455	526	618	536	574
30	561	404	494	633	537	573	596	471	533	611	523	571
31	---	---	---	601	511	537	529	435	488	---	---	---

MISSISSIPPI RIVER MAIN STEM

05331545 MISSISSIPPI RIVER AT FIFTH STREET AT NEWPORT, MN

PH (STANDARD UNITS), WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		OCTOBER			NOVEMBER			DECEMBER			JANUARY	
1	7.9	7.9	7.9	8.2	8.1	8.1	7.9	7.9	7.9	---	---	---
2	7.9	7.9	7.9	8.2	8.2	8.2	---	---	---	7.8	7.8	7.8
3	7.9	7.9	7.9	8.2	8.1	8.1	---	---	---	7.8	7.8	7.8
4	8.0	7.9	8.0	8.2	8.1	8.1	---	---	---	7.9	7.8	7.8
5	8.0	8.0	8.0	8.2	8.1	8.1	7.9	7.9	7.9	7.9	7.8	7.8
6	8.1	7.9	8.0	8.1	8.1	8.1	7.9	7.9	7.9	7.8	7.8	7.8
7	8.1	8.1	8.1	8.1	8.1	8.1	7.9	7.9	7.9	7.8	7.8	7.8
8	8.1	8.1	8.1	8.1	8.1	8.1	7.9	7.9	7.9	7.8	7.8	7.8
9	8.1	8.1	8.1	8.2	8.1	8.1	7.9	7.9	7.9	7.9	7.8	7.8
10	8.2	8.1	8.1	8.2	8.1	8.1	7.9	7.9	7.9	7.9	7.8	7.8
11	8.2	8.1	8.1	8.2	8.2	8.2	7.9	7.9	7.9	7.9	7.8	7.8
12	8.2	8.1	8.1	8.2	8.1	8.2	7.9	7.8	7.9	7.9	7.8	7.8
13	8.2	8.1	8.2	8.2	8.2	8.2	7.9	7.8	7.9	7.9	7.8	7.8
14	8.2	8.2	8.2	8.2	8.1	8.2	7.9	7.8	7.9	8.0	7.8	7.9
15	8.2	8.1	8.1	8.2	8.1	8.1	7.9	7.8	7.8	8.0	7.9	8.0
16	8.1	8.1	8.1	8.1	8.1	8.1	7.9	7.8	7.8	8.0	7.9	8.0
17	8.2	8.1	8.1	8.1	8.1	8.1	7.9	7.8	7.8	8.0	7.9	7.9
18	8.1	8.1	8.1	8.1	8.1	8.1	7.9	7.8	7.8	8.0	7.9	7.9
19	8.2	8.1	8.1	8.1	8.1	8.1	7.9	7.8	7.8	8.0	7.9	7.9
20	---	---	---	8.1	8.0	8.1	7.9	7.8	7.8	---	---	---
21	---	---	---	8.0	7.9	8.0	7.9	7.8	7.8	---	---	---
22	---	---	---	7.9	7.9	7.9	7.9	7.8	7.8	---	---	---
23	---	---	---	8.1	7.9	7.9	7.9	7.8	7.8	---	---	---
24	8.1	8.1	8.1	7.9	7.8	7.9	7.9	7.8	7.8	---	---	---
25	8.1	8.0	8.0	7.9	7.8	7.9	7.8	7.8	7.8	---	---	---
26	8.1	8.1	8.1	7.9	7.8	7.8	7.9	7.8	7.8	7.9	7.8	7.8
27	8.1	8.1	8.1	7.9	7.8	7.9	7.9	7.8	7.8	7.9	7.8	7.8
28	8.1	8.1	8.1	7.9	7.8	7.9	7.8	7.8	7.8	7.9	7.8	7.9
29	8.1	8.1	8.1	7.9	7.8	7.9	7.8	7.8	7.8	7.9	7.9	7.9
30	8.1	8.1	8.1	7.9	7.8	7.9	7.8	7.8	7.8	7.9	7.8	7.9
31	8.2	8.1	8.1	---	---	---	7.8	7.8	7.8	8.0	7.8	7.9
MONTH	---	---	---	8.2	7.8	8.0	---	---	---	---	---	---

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		FEBRUARY			MARCH			APRIL			MAY	
1	7.9	7.8	7.9	---	---	---	8.0	8.0	8.0	8.3	8.1	8.2
2	7.9	7.8	7.8	---	---	---	8.0	8.0	8.0	8.4	8.0	8.1
3	7.9	7.8	7.8	---	---	---	8.0	8.0	8.0	8.2	8.0	8.1
4	7.9	7.8	7.8	8.1	8.0	8.0	8.1	8.0	8.0	8.3	8.1	8.2
5	7.9	7.8	7.8	8.0	8.0	8.0	8.1	8.0	8.1	8.3	8.2	8.3
6	7.9	7.8	7.8	8.1	8.0	8.0	8.1	8.1	8.1	8.4	8.1	8.3
7	7.9	7.8	7.9	8.1	8.0	8.0	8.2	8.1	8.1	8.4	8.2	8.2
8	7.9	7.9	7.9	8.0	8.0	8.0	8.2	8.1	8.1	8.4	8.2	8.3
9	8.0	7.9	7.9	8.1	8.0	8.0	8.2	8.1	8.1	8.3	8.1	8.2
10	7.9	7.9	7.9	8.1	7.9	8.0	8.3	8.1	8.2	8.2	8.0	8.1
11	8.0	7.9	7.9	8.2	8.0	8.1	8.3	8.2	8.3	8.2	7.9	8.0
12	8.1	7.8	7.9	8.2	8.1	8.1	8.3	8.2	8.3	8.2	7.9	8.1
13	---	---	---	8.2	8.1	8.1	8.3	8.2	8.3	8.3	8.0	8.1
14	---	---	---	8.1	8.0	8.1	8.3	8.2	8.2	8.1	7.9	8.0
15	---	---	---	8.2	8.0	8.1	8.3	8.1	8.2	8.1	7.9	8.0
16	---	---	---	8.2	8.1	8.1	8.3	8.1	8.2	8.3	8.0	8.1
17	---	---	---	8.2	8.1	8.1	8.4	8.2	8.3	8.2	8.0	8.1
18	8.0	8.0	8.0	8.1	8.1	8.1	8.4	8.2	8.3	8.1	7.9	8.0
19	8.0	8.0	8.0	8.1	8.1	8.1	8.3	8.2	8.2	8.0	7.8	7.8
20	8.0	7.9	8.0	8.1	8.0	8.1	8.5	8.1	8.3	8.0	7.8	7.8
21	8.0	7.9	8.0	8.1	8.0	8.0	8.4	8.1	8.3	7.9	7.7	7.8
22	8.0	7.9	8.0	8.2	8.0	8.1	8.3	8.1	8.2	8.1	7.8	7.9
23	8.0	7.9	8.0	8.1	8.1	8.1	8.3	8.1	8.2	8.2	8.0	8.1
24	8.0	7.9	8.0	8.2	8.1	8.1	8.3	8.1	8.3	8.2	8.1	8.1
25	---	---	---	8.1	8.0	8.1	8.4	8.2	8.3	8.1	8.1	8.1
26	---	---	---	8.1	8.0	8.0	8.4	8.2	8.3	8.1	8.0	8.1
27	---	---	---	8.1	7.9	8.0	8.4	8.2	8.3	---	---	---
28	---	---	---	8.0	7.9	7.9	8.4	8.2	8.3	---	---	---
29	---	---	---	8.0	7.9	7.9	8.3	8.2	8.2	---	---	---
30	---	---	---	8.0	7.9	8.0	8.4	8.2	8.2	---	---	---
31	---	---	---	8.0	7.9	8.0	---	---	---	---	---	---
MONTH	---	---	---	---	---	---	8.5	8.0	8.2	---	---	---

05331545 MISSISSIPPI RIVER AT FIFTH STREET AT NEWPORT, MN

PH (STANDARD UNITS), WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		JUNE			JULY			AUGUST			SEPTEMBER	
1	---	---	---	8.1	7.8	7.9	8.0	7.9	7.9	8.2	7.9	8.1
2	---	---	---	8.1	7.9	8.0	7.9	7.8	7.8	8.1	7.9	8.0
3	---	---	---	8.0	7.6	7.9	---	---	---	8.1	7.9	7.9
4	8.0	7.9	7.9	8.1	7.8	7.9	7.4	7.4	7.4	---	---	---
5	8.1	7.8	8.0	8.1	7.9	8.0	7.7	7.3	7.5	---	---	---
6	8.1	7.9	8.0	8.1	7.7	7.9	7.8	7.6	7.6	---	---	---
7	8.1	7.9	8.0	8.0	7.8	7.9	7.9	7.7	7.8	7.9	7.7	7.8
8	8.1	7.8	8.0	7.9	7.7	7.8	7.9	7.8	7.8	7.8	7.6	7.7
9	8.1	7.9	8.0	8.0	7.7	7.8	7.8	7.6	7.7	---	---	---
10	8.1	7.9	8.0	8.1	7.7	7.9	7.8	7.6	7.7	---	---	---
11	8.0	7.8	7.9	7.8	7.7	7.7	8.0	7.7	7.8	7.6	7.5	7.5
12	8.1	7.8	7.9	---	---	---	7.8	7.7	7.8	7.5	7.4	7.5
13	8.1	7.9	8.0	---	---	---	7.8	7.6	7.7	7.5	7.4	7.4
14	8.1	7.9	8.0	7.7	7.6	7.7	7.6	7.6	7.6	7.8	7.4	7.6
15	8.2	7.9	8.1	---	---	---	7.7	7.5	7.6	7.8	7.5	7.7
16	8.2	8.0	8.1	---	---	---	7.6	7.4	7.5	7.8	7.6	7.7
17	8.1	7.8	8.0	---	---	---	8.1	7.4	7.8	7.8	7.7	7.7
18	7.9	7.7	7.8	---	---	---	---	---	---	7.8	7.6	7.7
19	8.0	7.7	7.8	---	---	---	8.3	7.9	8.1	7.8	7.7	7.8
20	7.9	7.7	7.8	8.0	7.9	8.0	8.3	8.1	8.2	7.9	7.7	7.8
21	7.8	7.7	7.8	8.1	7.9	8.0	8.2	8.1	8.1	7.9	7.8	7.8
22	7.9	7.6	7.7	8.0	7.8	7.9	8.1	8.0	8.1	7.9	7.8	7.8
23	7.8	7.7	7.8	---	---	---	---	---	---	8.1	7.8	7.9
24	7.9	7.8	7.8	---	---	---	---	---	---	8.0	7.9	7.9
25	8.0	7.8	7.9	---	---	---	---	---	---	8.2	7.8	8.0
26	8.0	7.8	7.9	---	---	---	8.1	7.9	8.0	8.2	8.0	8.1
27	7.9	7.8	7.8	7.9	7.8	7.8	8.0	7.9	8.0	8.2	8.1	8.1
28	8.0	7.7	7.8	7.9	7.7	7.9	8.0	7.9	7.9	8.2	8.1	8.1
29	7.9	7.5	7.8	8.0	7.8	7.9	8.1	7.9	8.0	8.0	7.9	8.0
30	8.0	7.8	7.9	8.0	7.9	7.9	8.1	7.9	8.0	8.0	7.9	8.0
31	---	---	---	8.1	7.8	8.0	8.2	7.9	8.0	---	---	---

TEMPERATURE, WATER (DEG. C), WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		OCTOBER			NOVEMBER			DECEMBER			JANUARY	
1	16.5	16.0	16.0	10.0	9.0	9.5	1.0	1.0	1.0	---	---	---
2	16.5	16.0	16.0	9.0	8.5	9.0	---	---	---	.5	.5	.5
3	16.0	16.0	16.0	6.5	6.5	7.5	---	---	---	.5	.5	.5
4	16.0	15.5	15.5	6.5	6.5	6.5	---	---	---	.5	.5	.5
5	15.5	15.0	15.5	6.5	6.0	6.0	.5	.5	.5	1.0	.5	1.0
6	16.0	15.0	15.0	6.5	6.0	6.0	.5	.5	.5	1.0	1.0	1.0
7	15.0	13.5	14.0	6.5	6.0	6.5	.5	.5	.5	1.0	1.0	1.0
8	13.5	13.0	13.5	6.5	6.0	6.5	.5	.5	.5	1.0	1.0	1.0
9	13.0	13.0	13.0	6.0	5.0	5.5	.5	.0	.5	1.0	1.0	1.0
10	13.0	12.5	12.5	5.0	3.5	4.0	.5	.0	.5	1.0	.5	1.0
11	12.5	12.0	12.0	3.5	3.0	3.0	.5	.5	.5	1.0	.5	.5
12	---	---	---	---	---	---	.5	.0	.0	1.0	.5	.5
13	11.5	11.0	11.0	2.0	2.0	2.0	.5	.0	.5	1.0	.5	1.0
14	11.0	11.0	11.0	2.0	.5	1.5	.5	.5	.5	1.0	.5	1.0
15	---	---	---	1.0	.5	1.0	.5	.5	.5	.5	.5	.5
16	9.5	9.0	9.5	1.0	.5	1.0	.5	.5	.5	.5	.5	.5
17	---	---	---	1.0	.5	.5	.5	.5	.5	.5	.5	.5
18	9.5	9.0	9.5	.5	.5	.5	.5	.5	.5	.5	.5	.5
19	9.5	9.5	9.5	.5	.5	.5	.5	.5	.5	.5	.5	.5
20	---	---	---	1.0	.5	.5	.5	.5	.5	---	---	---
21	---	---	---	.5	.0	.5	.5	.5	.5	---	---	---
22	---	---	---	.5	.5	.5	.5	.5	.5	---	---	---
23	---	---	---	.5	.5	.5	.5	.5	.5	---	---	---
24	11.0	11.0	11.0	.5	.5	.5	.5	.5	.5	---	---	---
25	11.0	11.0	11.0	1.0	.5	.5	.5	.5	.5	---	---	---
26	11.0	10.5	11.0	1.0	1.0	1.0	.5	.5	.5	.5	.5	.5
27	11.0	10.5	10.5	1.0	.5	1.0	.5	.5	.5	.5	.5	.5
28	11.0	10.5	10.5	1.0	1.0	1.0	.5	.5	.5	1.0	.5	.5
29	11.0	10.5	10.5	1.5	1.0	1.0	1.0	.5	.5	.5	.5	.5
30	10.5	9.0	10.5	1.0	1.0	1.0	1.0	.5	.5	1.0	.5	.5
31	11.0	10.0	10.0	---	---	---	1.0	.5	.5	1.0	.5	.5

MISSISSIPPI RIVER MAIN STEM

05331545 MISSISSIPPI RIVER AT FIFTH STREET AT NEWPORT, MN

TEMPERATURE, WATER (DEG. C), WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		FEBRUARY			MARCH			APRIL			MAY	
1	1.0	.5	1.0	---	---	---	5.5	5.0	5.5	16.0	15.0	15.5
2	1.0	.5	.5	---	---	---	5.5	5.0	5.0	16.0	15.5	15.5
3	.5	.5	.5	---	---	---	5.5	5.0	5.5	15.5	15.0	15.5
4	1.0	.5	.5	3.0	2.5	2.5	6.0	5.5	5.5	15.5	15.0	15.5
5	1.0	.5	.5	3.5	2.5	3.0	6.5	6.0	6.0	16.0	15.0	15.5
6	1.0	.5	1.0	4.5	3.0	4.0	7.5	6.5	7.0	16.5	15.5	16.0
7	1.5	.5	1.0	5.0	4.5	5.0	8.5	7.0	7.5	17.0	16.0	16.5
8	1.5	1.0	1.0	5.0	5.0	5.0	9.0	8.0	8.5	18.5	17.0	17.5
9	1.0	.5	1.0	5.5	4.5	5.0	9.5	8.5	9.0	19.0	18.0	18.5
10	1.0	.5	1.0	5.0	4.5	4.5	12.0	9.5	10.5	19.0	18.5	18.5
11	1.5	1.0	1.0	4.0	3.5	3.5	11.5	11.5	11.5	21.0	19.0	20.0
12	1.5	1.0	1.5	3.5	3.0	3.5	12.0	11.0	11.5	21.0	20.5	20.5
13	---	---	---	4.0	3.0	3.5	12.5	11.5	12.0	20.5	20.5	20.5
14	---	---	---	4.0	3.5	4.0	12.5	12.0	12.5	20.5	20.5	20.5
15	---	---	---	4.0	3.5	4.0	12.5	11.5	12.0	20.5	19.0	20.5
16	---	---	---	4.0	3.5	4.0	12.5	12.0	12.5	21.0	20.5	20.5
17	---	---	---	4.0	3.5	4.0	13.5	12.5	13.0	21.5	20.5	21.0
18	1.0	.5	1.0	4.0	4.0	4.0	14.0	13.0	13.5	21.0	20.5	20.5
19	1.0	1.0	1.0	4.5	4.0	4.0	14.5	13.5	14.0	20.5	20.0	20.0
20	1.5	1.0	1.0	4.5	4.0	4.5	16.0	14.5	15.5	20.5	20.0	20.5
21	1.5	1.0	1.5	4.5	4.5	4.5	16.0	13.0	15.5	20.5	20.0	20.0
22	1.5	1.5	1.5	5.5	4.5	5.0	15.5	15.0	15.0	21.0	19.0	19.5
23	2.0	1.5	1.5	6.5	5.0	6.0	15.0	14.5	15.0	19.5	19.0	19.0
24	2.0	1.0	1.5	7.0	6.5	7.0	15.0	14.5	14.5	19.0	19.0	19.0
25	---	---	---	7.5	7.0	7.0	15.0	14.5	15.0	19.0	18.5	19.0
26	---	---	---	7.5	7.0	7.0	15.5	15.0	15.0	19.5	18.5	19.0
27	---	---	---	7.5	7.0	7.0	15.5	15.0	15.5	20.5	19.0	19.0
28	---	---	---	7.0	6.5	7.0	16.0	15.5	15.5	---	---	---
29	---	---	---	6.5	6.0	6.0	16.0	15.5	16.0	---	---	---
30	---	---	---	6.0	5.5	5.5	16.0	15.0	15.5	---	---	---
31	---	---	---	5.5	5.0	5.5	---	---	---	---	---	---
MONTH	---	---	---	---	---	---	16.0	5.0	11.5	---	---	---

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		JUNE			JULY			AUGUST			SEPTEMBER	
1	---	---	---	26.5	24.5	25.0	29.0	28.5	28.5	20.5	20.0	20.5
2	---	---	---	25.5	24.5	25.0	29.0	28.5	28.5	21.0	20.5	21.0
3	---	---	---	26.0	25.0	25.0	30.5	28.5	29.5	21.0	20.5	20.5
4	22.0	21.5	22.0	25.5	25.0	25.0	30.0	29.0	29.5	---	---	---
5	22.0	21.5	22.0	26.0	25.0	25.0	29.0	27.5	28.5	---	---	---
6	22.5	22.0	22.5	25.5	24.5	25.0	28.5	27.0	27.5	---	---	---
7	23.0	22.5	22.5	26.0	25.0	25.5	27.0	26.5	27.0	21.5	21.0	21.5
8	23.5	23.0	23.0	26.5	25.5	26.0	26.5	26.5	26.5	21.5	21.0	21.0
9	23.5	23.0	23.0	27.0	26.0	26.5	26.5	26.0	26.5	---	---	---
10	23.0	22.5	22.5	28.0	26.5	28.0	26.5	24.5	25.0	---	---	---
11	25.5	22.0	22.5	28.0	27.5	28.0	25.0	24.5	25.0	21.0	21.0	21.0
12	23.0	22.0	22.5	---	---	---	25.0	24.5	25.0	---	---	---
13	23.5	23.0	23.0	---	---	---	26.5	24.5	25.5	21.0	20.0	20.5
14	24.5	23.5	24.0	26.5	26.0	26.0	26.5	26.0	26.0	20.5	20.0	20.0
15	26.0	24.5	25.0	---	---	---	26.5	26.0	26.0	21.0	20.0	20.5
16	26.0	23.5	25.5	---	---	---	26.5	26.0	26.0	20.5	20.0	20.5
17	26.5	25.5	26.0	---	---	---	26.5	24.5	25.0	20.5	19.5	20.5
18	26.5	26.0	26.0	---	---	---	---	---	---	20.0	19.5	20.0
19	26.5	24.5	26.0	---	---	---	25.0	24.0	24.5	21.0	19.5	20.0
20	26.5	26.0	26.5	26.5	26.0	26.5	24.5	24.0	24.5	19.5	19.0	19.5
21	27.0	26.0	26.5	27.5	26.5	27.0	24.5	24.5	24.5	20.0	19.0	19.0
22	27.0	26.5	26.5	27.5	27.0	27.0	24.5	24.0	24.0	19.5	19.0	19.0
23	27.0	26.5	26.5	---	---	---	---	---	---	20.0	19.0	19.5
24	28.0	26.5	27.0	---	---	---	---	---	---	19.5	19.0	19.0
25	27.5	27.0	27.5	---	---	---	---	---	---	19.5	19.0	19.5
26	27.0	26.5	27.0	---	---	---	21.5	21.0	21.5	20.0	19.0	19.5
27	26.5	26.0	26.5	27.5	27.0	27.0	21.0	21.0	21.0	20.0	19.5	19.5
28	---	---	---	27.5	27.0	27.0	21.0	20.5	20.5	20.0	19.5	20.0
29	26.0	25.0	25.5	27.5	27.0	27.5	21.0	20.5	20.5	20.0	19.5	20.0
30	25.5	25.0	25.5	28.0	27.5	28.0	20.5	20.0	20.5	20.0	19.5	19.5
31	---	---	---	28.5	28.5	28.5	20.5	20.0	20.0	---	---	---

MISSISSIPPI RIVER MAIN STEM

05331545 MISSISSIPPI RIVER AT FIFTH STREET AT NEWPORT, MN

OXYGEN, DISSOLVED (DO), MG/L, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		OCTOBER			NOVEMBER			DECEMBER			JANUARY	
1	8.6	8.1	8.3	11.0	10.5	10.7	---	---	---	---	---	---
2	9.2	8.0	8.4	11.1	10.6	10.9	---	---	---	12.9	12.2	12.7
3	8.5	8.3	8.4	11.8	11.1	11.3	---	---	---	13.1	12.8	12.9
4	8.6	8.4	8.5	12.0	10.6	11.3	---	---	---	13.2	12.8	12.9
5	8.6	8.4	8.6	11.5	10.5	11.3	---	---	---	12.9	12.8	12.9
6	8.9	8.4	8.7	11.6	10.7	11.2	---	---	---	13.0	12.1	12.7
7	9.1	7.2	8.8	11.4	11.0	11.1	---	---	---	13.2	12.6	12.9
8	9.5	9.1	9.3	11.9	11.0	11.4	12.9	12.7	12.8	13.3	12.0	13.0
9	9.8	8.9	9.6	12.6	11.9	12.2	13.0	12.1	12.7	12.9	12.7	12.8
10	10.0	9.4	9.7	13.1	11.3	12.1	12.9	12.7	12.8	12.9	12.7	12.8
11	10.3	9.6	10.0	12.5	10.3	12.1	12.8	12.1	12.5	13.0	12.8	12.9
12	10.7	9.1	10.4	13.7	11.1	12.9	12.8	12.5	12.7	13.4	12.9	13.1
13	11.0	10.7	10.8	13.8	11.3	13.2	13.0	12.7	12.8	13.4	12.9	13.3
14	11.1	9.0	10.7	13.0	12.6	12.8	12.8	12.6	12.7	14.8	13.3	14.2
15	10.8	9.8	10.6	12.6	12.0	12.4	12.8	12.3	12.5	---	---	---
16	10.9	10.4	10.6	12.5	12.2	12.4	13.0	10.9	11.9	---	---	---
17	10.8	6.8	10.4	12.8	12.4	12.6	13.7	13.3	13.5	---	---	---
18	10.6	9.9	10.3	13.2	11.0	12.5	13.6	12.0	13.3	---	---	---
19	10.5	9.8	10.2	13.2	12.6	13.0	13.5	13.3	13.4	---	---	---
20	---	---	---	13.3	10.3	13.0	13.5	13.2	13.4	---	---	---
21	---	---	---	13.5	13.0	13.3	13.6	13.3	13.5	---	---	---
22	---	---	---	13.5	13.3	13.5	13.7	13.4	13.6	---	---	---
23	---	---	---	13.7	12.7	13.5	13.6	13.0	13.4	---	---	---
24	9.3	9.0	9.2	13.9	12.8	13.8	13.5	13.4	13.5	---	---	---
25	9.6	8.2	9.4	13.7	13.0	13.6	13.6	13.5	13.5	---	---	---
26	9.8	9.2	9.6	13.7	13.4	13.6	13.7	12.6	13.5	---	---	---
27	9.9	8.9	9.6	13.7	13.3	13.6	13.8	13.5	13.7	13.3	12.1	13.0
28	9.9	8.2	9.5	13.9	13.0	13.4	13.7	13.5	13.6	13.2	12.9	13.1
29	10.1	9.5	9.8	13.7	13.5	13.6	14.2	13.0	13.4	13.1	12.3	12.9
30	10.3	9.0	10.0	13.9	13.5	13.7	13.2	12.9	13.1	13.6	13.1	13.4
31	10.4	9.0	10.2	---	---	---	13.2	12.9	13.1	13.7	13.3	13.6
MONTH	---	---	---	13.9	10.3	12.5	---	---	---	---	---	---

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		FEBRUARY			MARCH			APRIL			MAY	
1	13.9	13.5	13.7	---	---	---	10.9	10.7	10.8	---	---	---
2	13.9	12.7	13.2	---	---	---	11.1	10.0	10.5	7.2	6.2	6.7
3	13.0	12.4	12.7	---	---	---	11.0	10.5	10.7	7.2	6.0	6.6
4	13.6	12.6	12.7	13.4	13.1	13.3	10.6	10.3	10.5	---	---	---
5	12.7	12.5	12.6	13.2	12.4	12.7	10.9	10.2	10.4	10.0	8.2	9.2
6	12.8	12.0	12.4	12.8	12.4	12.6	11.0	10.3	10.7	10.5	6.9	9.3
7	12.9	12.1	12.3	12.6	12.2	12.4	11.1	10.9	11.0	10.0	8.0	9.3
8	12.2	12.1	12.2	12.3	12.2	12.2	11.0	11.0	11.0	9.0	6.9	8.3
9	13.0	12.2	12.7	12.5	11.6	12.0	11.0	10.9	11.0	8.4	7.2	7.7
10	12.9	12.0	12.6	12.4	11.0	11.9	11.8	10.9	11.2	---	---	---
11	12.6	12.1	12.4	12.8	12.1	12.5	11.4	10.7	11.0	8.6	7.2	7.9
12	13.3	12.0	12.7	12.9	11.9	12.5	12.0	10.5	11.2	8.1	6.1	7.2
13	---	---	---	12.5	12.3	12.4	11.3	10.2	10.8	7.2	6.2	6.7
14	---	---	---	12.5	12.3	12.4	10.3	8.5	9.6	---	---	---
15	---	---	---	12.6	12.3	12.4	11.0	8.4	9.0	6.6	6.6	6.6
16	---	---	---	12.4	11.8	12.1	10.4	8.7	9.3	8.5	6.4	7.1
17	---	---	---	12.0	11.8	11.9	11.5	9.2	10.2	7.1	5.5	6.0
18	13.1	12.8	12.9	11.8	11.6	11.7	11.4	9.6	10.4	---	---	---
19	12.9	11.2	12.6	11.6	11.5	11.6	10.6	9.2	10.0	7.5	6.2	6.8
20	13.0	12.6	12.8	11.7	10.8	11.4	11.2	8.5	9.8	7.0	5.6	6.5
21	13.0	12.7	12.8	11.4	11.3	11.4	10.8	8.2	8.8	7.8	5.5	6.7
22	12.8	12.6	12.7	11.4	10.9	11.1	8.4	7.4	7.8	---	---	---
23	12.8	12.6	12.7	11.1	10.8	10.9	9.0	6.8	8.0	---	---	---
24	13.4	12.6	12.9	10.9	10.0	10.4	9.8	7.7	8.9	---	---	---
25	---	---	---	11.0	10.3	10.8	10.2	8.3	9.3	---	---	---
26	---	---	---	11.1	10.5	11.0	10.5	9.0	9.7	9.3	8.1	8.8
27	---	---	---	11.3	11.0	11.2	10.7	9.3	10.0	8.6	7.1	7.7
28	---	---	---	11.2	10.7	11.0	11.2	8.9	9.9	---	---	---
29	---	---	---	11.2	10.7	11.0	10.1	8.5	9.3	---	---	---
30	---	---	---	11.0	10.9	11.0	10.5	8.1	9.1	---	---	---
31	---	---	---	11.2	10.0	10.6	---	---	---	---	---	---
MONTH	---	---	---	---	---	---	12.0	6.8	10.0	---	---	---

05331545 MISSISSIPPI RIVER AT FIFTH STREET AT NEWPORT, MN

OXYGEN, DISSOLVED (DO), MG/L, WATER YEAR OCTOBER 1936 TO SEPTEMBER 1987

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		JUNE			JULY			AUGUST			SEPTEMBER	
1	---	---	---	7.1	7.1	7.1	7.4	5.7	6.5	9.5	8.3	9.1
2	---	---	---	9.7	7.2	8.2	6.1	6.0	6.0	9.5	8.1	9.0
3	---	---	---	7.9	5.2	6.2	6.7	5.8	6.3	9.6	8.0	8.6
4	8.5	7.3	7.9	7.4	4.9	5.9	6.6	5.2	5.8	---	---	---
5	8.6	7.5	8.0	8.2	6.5	7.0	6.3	4.7	5.6	---	---	---
6	9.0	7.7	8.3	8.3	6.3	7.3	6.9	5.3	6.1	---	---	---
7	8.3	7.2	7.7	7.2	6.2	6.7	8.3	6.0	7.0	9.0	6.3	7.6
8	8.7	6.9	7.9	---	---	---	7.7	6.8	7.3	8.6	6.5	7.6
9	8.1	6.6	7.3	---	---	---	7.5	5.1	6.5	---	---	---
10	7.6	7.5	7.5	7.5	6.7	7.1	7.8	5.8	6.8	---	---	---
11	8.6	6.2	7.4	---	---	---	8.0	6.0	7.0	6.5	5.5	6.0
12	8.7	7.2	8.0	---	---	---	---	---	---	---	---	---
13	8.6	7.4	8.0	---	---	---	6.4	5.7	6.0	---	---	---
14	8.5	7.2	7.9	6.4	4.1	5.3	6.7	5.7	6.2	8.0	5.0	6.5
15	8.5	6.7	7.7	---	---	---	6.4	5.0	5.6	8.7	6.5	7.2
16	7.9	6.2	7.2	7.6	6.3	7.0	---	---	---	7.4	6.5	6.9
17	7.0	5.2	6.3	---	---	---	---	---	---	7.3	6.8	7.0
18	6.3	4.9	5.5	7.4	5.8	6.0	---	---	---	7.2	6.0	6.6
19	7.5	4.9	6.4	---	---	---	---	---	---	7.7	5.7	6.5
20	7.4	6.4	6.9	7.5	5.7	6.6	---	---	---	8.0	6.9	7.6
21	7.3	5.9	6.6	---	---	---	---	---	---	9.2	7.5	8.2
22	7.5	5.0	6.2	7.7	6.0	6.8	---	---	---	8.7	8.3	8.5
23	8.6	6.4	7.4	---	---	---	---	---	---	8.6	8.0	8.3
24	8.4	6.7	7.5	---	---	---	---	---	---	9.1	8.3	8.6
25	8.4	6.4	7.4	---	---	---	---	---	---	9.4	8.6	8.8
26	8.3	6.7	7.5	---	---	---	7.3	7.0	7.2	9.8	8.3	8.7
27	8.1	6.1	7.1	6.3	5.8	6.1	7.8	7.0	7.4	9.0	8.1	8.6
28	7.8	5.7	6.6	7.7	6.4	7.0	8.6	7.1	7.9	8.9	7.5	8.1
29	---	---	---	6.9	5.9	6.5	9.0	7.8	8.4	7.7	6.8	7.3
30	---	---	---	6.6	5.4	5.9	---	---	---	7.3	6.4	6.8
31	---	---	---	7.5	6.3	6.9	---	---	---	---	---	---

MISSISSIPPI RIVER MAIN STEM

05331560 MISSISSIPPI RIVER AT GREY CLOUD ISLAND NEAR COTTAGE GROVE, MN

WATER-QUALITY RECORDS

LOCATION.--Lat 44°48'13", long 93°00'43", in NW¼NE¼ sec.26, T.27 N., R.22 W., Washington County, Hydrologic Unit 07010206, on left bank at the J. L. Shiely Co. loading dock, and at mile 826.2 upstream from Ohio River.

PERIOD OF RECORD.--February 1977 to current year.

PERIOD OF DAILY RECORD.--
SPECIFIC CONDUCTANCE: September 1977 to current year.
pH: September 1977 to current year.
WATER TEMPERATURES: September 1977 to current year.
DISSOLVED OXYGEN: September 1977 to current year.

INSTRUMENTATION.--Water-quality monitor since September 1977.

REMARKS.--Extremes are published for years with 80 percent or more daily record.

COOPERATION.--Water-quality monitor is operated by the Metropolitan Waste Control Commission, St. Paul, MN.

EXTREMES FOR PERIOD OF DAILY RECORD.--
SPECIFIC CONDUCTANCE (water year 1981-87): Maximum, 773 microsiemens Feb. 23, 1985; minimum, 243 microsiemens Mar. 19, 1985.
pH (water year 1981, 1984-87): Maximum, 8.7 units May 13, Sept. 6, 7, 9, 13, 1981, Mar. 16, 17, 1984; minimum, 7.0 units Oct. 10, 1983, Aug. 15, 1985.
WATER TEMPERATURES (water year 1981-87): Maximum, 29.0°C Aug. 7, 1982; minimum, 0.0°C several days during winter period.
DISSOLVED OXYGEN (water year 1981-82, 1984-87): Maximum, 16.0 mg/L Jan. 18, 1985; minimum, 1.1 mg/L June 30, 1986.

EXTREMES FOR CURRENT YEAR.--
SPECIFIC CONDUCTANCE: Maximum, 756 microsiemens Apr 6; minimum, 419 microsiemens Aug. 9-10.
pH: Maximum, 8.5 units May 4-7, Aug. 31, Sep. 25; minimum, 7.2 units Dec. 26, Aug. 11.
WATER TEMPERATURES: Maximum, 28.0°C Aug. 4; minimum, 0.5°C several days during winter period.
DISSOLVED OXYGEN: Maximum, 14.9 mg/L Feb. 18; minimum, 4.2 mg/L Jul. 8.

SPECIFIC CONDUCTANCE (MICROSIEMENS/CM AT 25 DEG. C), WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		OCTOBER			NOVEMBER			DECEMBER			JANUARY	
1	488	421	468	581	564	575	---	---	---	594	585	588
2	498	486	491	604	558	562	---	---	---	601	579	585
3	543	498	519	613	553	572	---	---	---	594	583	591
4	546	535	538	589	546	549	611	584	603	584	572	578
5	545	538	540	550	544	547	615	551	580	581	553	562
6	562	536	540	565	546	548	---	---	---	568	555	561
7	600	542	565	558	547	553	---	---	---	592	566	581
8	599	582	588	556	537	548	641	605	623	587	570	580
9	---	---	---	568	549	559	613	593	600	576	566	570
10	---	---	---	569	567	568	629	571	608	580	571	575
11	546	531	538	---	---	---	638	612	624	581	557	569
12	589	513	523	---	---	---	640	593	609	587	557	570
13	---	---	---	555	536	548	601	592	595	574	546	562
14	---	---	---	621	555	596	643	601	620	557	549	553
15	---	---	---	621	597	611	648	620	639	605	553	581
16	551	545	548	660	586	596	620	574	589	616	599	605
17	---	---	---	639	568	588	604	563	584	652	608	631
18	---	---	---	597	564	572	626	593	606	646	633	638
19	---	---	---	579	567	573	629	622	624	636	620	627
20	---	---	---	584	571	578	632	617	624	629	619	622
21	---	---	---	612	581	597	641	628	632	623	595	606
22	---	---	---	617	597	604	645	630	638	607	598	603
23	---	---	---	624	599	613	642	630	635	---	---	---
24	---	---	---	634	624	631	635	622	628	---	---	---
25	605	586	595	651	627	635	634	618	626	---	---	---
26	---	---	---	---	---	---	632	608	613	---	---	---
27	---	---	---	678	653	664	612	603	609	---	---	---
28	---	---	---	---	---	---	608	597	602	---	---	---
29	605	583	591	---	---	---	626	595	598	---	---	---
30	544	535	540	---	---	---	597	583	586	---	---	---
31	590	577	584	---	---	---	595	583	590	---	---	---

05331560 MISSISSIPPI RIVER AT GREY CLOUD ISLAND NEAR COTTAGE GROVE, MN

SPECIFIC CONDUCTANCE (MICROSIEMENS/CM AT 25 DEG. C), WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		FEBRUARY			MARCH			APRIL			MAY	
1	---	---	---	567	554	561	666	641	650	---	---	---
2	---	---	---	586	557	573	675	663	670	---	---	---
3	---	---	---	586	561	574	708	609	687	---	---	---
4	617	608	612	571	561	567	712	703	707	645	622	628
5	612	595	605	585	564	576	721	708	713	658	625	639
6	595	538	562	598	577	587	756	714	736	652	606	621
7	549	533	542	598	581	591	744	725	732	617	591	604
8	542	532	538	586	578	582	733	705	726	647	599	622
9	585	529	553	587	546	564	730	726	727	652	610	622
10	581	545	572	552	525	541	728	665	690	639	609	627
11	583	574	578	550	525	538	674	650	663	634	613	627
12	577	565	571	550	526	537	659	650	654	642	600	631
13	571	555	562	---	---	---	656	629	642	634	610	624
14	563	546	556	---	---	---	631	624	628	639	619	628
15	551	544	546	---	---	---	667	620	624	651	623	638
16	562	543	547	543	539	541	629	615	621	644	621	637
17	619	535	565	547	523	533	625	618	621	633	608	620
18	552	524	534	574	527	556	623	608	614	637	597	617
19	546	523	528	577	547	569	617	612	614	622	599	608
20	547	533	541	---	---	---	655	615	639	606	578	591
21	558	540	547	---	---	---	663	652	657	588	571	580
22	549	541	545	---	---	---	670	652	659	600	571	586
23	558	543	551	---	---	---	671	634	658	587	547	563
24	568	556	561	556	539	543	660	611	627	532	500	513
25	564	555	560	548	530	537	643	608	629	508	462	481
26	565	558	562	535	517	529	644	628	634	492	462	472
27	568	562	564	539	513	526	628	580	610	470	454	463
28	570	557	564	569	531	550	---	---	---	---	---	---
29	---	---	---	598	561	577	---	---	---	---	---	---
30	---	---	---	621	599	609	---	---	---	---	---	---
31	---	---	---	641	622	632	---	---	---	---	---	---

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		JUNE			JULY			AUGUST			SEPTEMBER	
1	---	---	---	626	595	606	---	---	---	557	530	542
2	---	---	---	626	592	611	---	---	---	558	515	530
3	---	---	---	626	591	607	---	---	---	533	517	523
4	523	506	515	628	614	620	480	442	450	529	519	524
5	538	465	524	628	606	614	---	---	---	554	514	523
6	557	537	547	609	560	598	---	---	---	565	515	537
7	541	530	534	566	442	526	459	438	451	571	523	544
8	581	542	563	617	514	574	466	447	459	539	521	530
9	590	524	581	633	606	613	474	419	453	551	490	534
10	590	551	571	658	608	633	455	419	439	561	533	545
11	583	562	576	660	613	639	488	436	479	535	523	528
12	578	546	569	620	514	609	499	479	490	530	520	525
13	579	556	564	621	595	610	483	464	470	552	520	537
14	557	543	549	605	489	600	491	477	486	564	501	556
15	563	548	555	612	598	605	493	475	485	553	518	531
16	---	---	---	631	604	613	503	486	491	560	523	548
17	565	529	550	670	631	649	498	469	486	555	523	536
18	576	542	559	691	604	678	496	461	481	551	520	535
19	621	552	591	680	663	672	520	490	507	597	485	549
20	606	572	580	690	608	669	523	507	514	600	525	545
21	623	577	607	669	563	619	539	517	528	548	509	522
22	611	551	594	676	566	633	535	515	522	558	458	532
23	653	599	623	---	---	---	520	501	512	562	520	533
24	680	602	634	---	---	---	531	509	516	552	529	539
25	648	584	632	---	---	---	533	525	528	560	504	533
26	671	629	645	517	494	512	540	517	523	551	519	543
27	663	611	626	517	471	495	543	535	537	540	515	525
28	631	607	613	532	435	498	543	523	532	529	517	522
29	---	---	---	---	---	---	533	507	516	551	509	536
30	604	537	588	---	---	---	515	507	510	555	526	536
31	---	---	---	---	---	---	540	505	516	---	---	---
MONTH	---	---	---	---	---	---	---	---	---	600	458	535

MISSISSIPPI RIVER MAIN STEM

05331560 MISSISSIPPI RIVER AT GREY CLOUD ISLAND NEAR COTTAGE GROVE, MN

PH (STANDARD UNITS), WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		OCTOBER			NOVEMBER			DECEMBER			JANUARY	
1	8.0	7.9	7.9	8.2	8.1	8.2	7.9	7.8	7.8	7.9	7.9	7.9
2	8.1	7.9	8.0	8.2	8.1	8.2	7.9	7.9	7.9	7.9	7.8	7.9
3	8.0	7.9	7.9	8.2	8.2	8.2	7.9	7.9	7.9	7.9	7.8	7.9
4	8.0	7.9	7.9	8.2	8.1	8.1	8.0	7.9	7.9	7.9	7.8	7.9
5	8.1	7.9	8.0	8.2	8.1	8.2	8.0	7.9	7.9	7.9	7.9	7.9
6	8.1	8.0	8.1	8.2	8.1	8.1	7.9	7.9	7.9	7.9	7.9	7.9
7	8.1	8.0	8.0	8.2	8.1	8.1	7.9	7.9	7.9	7.9	7.9	7.9
8	8.1	8.0	8.0	8.2	8.1	8.1	7.9	7.9	7.9	7.9	7.8	7.9
9	---	---	---	8.2	8.2	8.2	7.9	7.9	7.9	8.0	7.9	7.9
10	---	---	---	8.2	8.2	8.2	7.9	7.8	7.9	8.0	7.9	7.9
11	8.1	8.0	8.1	8.3	8.2	8.2	7.9	7.9	7.9	8.0	7.9	7.9
12	---	---	---	8.3	8.2	8.2	7.9	7.9	7.9	8.0	7.9	7.9
13	---	---	---	8.3	8.2	8.2	7.9	7.9	7.9	7.9	7.9	7.9
14	---	---	---	8.2	8.2	8.2	7.9	7.8	7.9	7.9	7.9	7.9
15	---	---	---	8.2	8.2	8.2	7.9	7.9	7.9	8.0	7.9	8.0
16	8.1	8.1	8.1	8.2	8.1	8.2	7.9	7.8	7.9	8.0	7.9	8.0
17	---	---	---	8.2	8.1	8.1	7.9	7.9	7.9	8.0	7.9	7.9
18	---	---	---	8.2	8.1	8.1	7.9	7.9	7.9	8.0	7.9	7.9
19	---	---	---	8.1	8.1	8.1	7.9	7.9	7.9	8.0	7.9	7.9
20	---	---	---	8.1	8.0	8.1	7.9	7.9	7.9	8.0	7.9	7.9
21	---	---	---	8.1	7.9	8.0	7.9	7.9	7.9	8.0	7.9	7.9
22	---	---	---	7.9	7.9	7.9	7.9	7.9	7.9	8.0	7.9	7.9
23	---	---	---	7.9	7.9	7.9	7.9	7.9	7.9	---	---	---
24	---	---	---	7.9	7.9	7.9	7.9	7.9	7.9	---	---	---
25	8.1	8.1	8.1	7.9	7.9	7.9	7.9	7.5	7.7	---	---	---
26	---	---	---	7.9	7.9	7.9	7.9	7.2	7.5	---	---	---
27	---	---	---	7.9	7.9	7.9	7.6	7.5	7.5	---	---	---
28	---	---	---	7.9	7.9	7.9	7.6	7.5	7.6	---	---	---
29	8.2	8.1	8.1	7.9	7.9	7.9	7.9	7.5	7.7	---	---	---
30	8.1	8.1	8.1	7.9	7.9	7.9	7.9	7.8	7.9	---	---	---
31	8.2	8.1	8.1	---	---	---	7.9	7.9	7.9	---	---	---
MONTH	---	---	---	8.3	7.9	8.1	8.0	7.2	7.8	---	---	---

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		FEBRUARY			MARCH			APRIL			MAY	
1	---	---	---	8.0	7.9	8.0	8.1	8.0	8.0	---	---	---
2	---	---	---	8.0	7.9	8.0	8.0	8.0	8.0	---	---	---
3	---	---	---	8.0	8.0	8.0	8.1	8.0	8.0	---	---	---
4	7.8	7.7	7.7	8.0	8.0	8.0	8.1	8.0	8.0	8.5	8.3	8.4
5	7.8	7.7	7.8	8.0	8.0	8.0	8.1	8.0	8.0	8.5	8.3	8.4
6	7.8	7.8	7.8	8.0	8.0	8.0	8.1	8.0	8.1	8.5	8.3	8.4
7	7.8	7.8	7.8	8.0	8.0	8.0	8.2	8.0	8.1	8.5	8.3	8.4
8	7.9	7.8	7.9	8.0	8.0	8.0	8.2	8.0	8.1	8.4	8.3	8.3
9	7.9	7.9	7.9	8.1	8.0	8.0	8.2	8.0	8.1	8.4	8.2	8.2
10	7.9	7.8	7.9	8.1	8.0	8.0	8.4	8.1	8.2	8.1	7.9	8.0
11	7.9	7.9	7.9	8.1	8.0	8.1	8.3	8.2	8.3	8.1	7.9	8.0
12	7.9	7.9	7.9	8.1	8.0	8.1	8.3	8.2	8.3	8.0	7.9	8.0
13	7.9	7.9	7.9	---	---	---	8.4	8.2	8.3	8.3	7.8	7.9
14	7.9	7.9	7.9	---	---	---	8.4	8.2	8.3	8.1	7.9	8.0
15	8.0	7.9	7.9	---	---	---	8.3	8.3	8.3	8.2	7.8	8.0
16	8.0	8.0	8.0	8.2	7.9	8.1	8.4	8.2	8.3	8.0	7.7	7.9
17	8.0	7.9	8.0	8.2	8.1	8.1	8.4	8.2	8.3	8.1	7.9	7.9
18	8.1	7.9	8.0	8.2	8.1	8.1	8.4	8.3	8.3	8.3	7.8	8.2
19	8.0	7.9	8.0	8.2	8.1	8.1	8.4	8.3	8.3	8.2	7.9	8.0
20	8.0	8.0	8.0	---	---	---	8.4	8.2	8.3	8.0	7.8	8.0
21	8.0	7.9	8.0	---	---	---	8.3	8.2	8.3	8.0	7.9	7.9
22	8.0	7.9	8.0	---	---	---	8.2	8.1	8.2	---	---	---
23	8.0	7.9	7.9	---	---	---	8.2	8.0	8.1	---	---	---
24	7.9	7.9	7.9	8.2	8.1	8.1	8.4	8.0	8.2	---	---	---
25	7.9	7.9	7.9	8.2	8.1	8.1	8.4	8.3	8.3	---	---	---
26	8.0	7.9	7.9	8.2	8.1	8.1	8.4	8.3	8.3	---	---	---
27	8.0	7.9	7.9	8.1	8.1	8.1	8.4	8.3	8.3	8.3	7.9	8.2
28	8.0	7.9	7.9	8.1	8.0	8.1	---	---	---	---	---	---
29	---	---	---	8.1	8.1	8.1	---	---	---	---	---	---
30	---	---	---	8.1	8.0	8.1	---	---	---	---	---	---
31	---	---	---	8.1	8.0	8.0	---	---	---	---	---	---

MISSISSIPPI RIVER MAIN STEM

05331560 MISSISSIPPI RIVER AT GREY CLOUD ISLAND NEAR COTTAGE GROVE, MN

PH (STANDARD UNITS), WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		JUNE			JULY			AUGUST			SEPTEMBER	
1	---	---	---	8.3	8.0	8.1	---	---	---	8.4	7.7	8.2
2	---	---	---	8.3	8.1	8.2	---	---	---	8.3	7.9	8.1
3	---	---	---	8.3	8.2	8.2	---	---	---	8.2	7.9	8.0
4	8.0	7.9	8.0	8.3	8.1	8.2	---	---	---	8.2	7.9	8.0
5	8.2	7.7	7.9	8.4	8.1	8.2	---	---	---	8.1	7.9	8.0
6	8.1	7.6	7.8	8.3	8.0	8.2	---	---	---	---	---	---
7	8.1	7.9	8.0	8.2	8.0	8.1	8.1	7.4	7.9	8.1	7.7	7.9
8	8.1	7.9	8.0	8.2	7.9	8.0	8.0	7.8	7.9	8.1	7.7	7.9
9	8.1	7.9	8.0	8.4	8.0	8.2	8.0	7.8	7.9	8.0	7.9	7.9
10	8.1	7.9	8.0	8.4	8.1	8.3	8.1	7.7	7.9	8.0	7.8	7.9
11	8.0	7.8	7.9	8.2	8.1	8.1	8.2	7.2	7.7	8.0	7.9	7.9
12	8.2	7.4	7.7	8.1	7.9	8.0	8.0	7.3	7.8	7.9	7.8	7.9
13	8.3	6.9	8.1	8.1	7.9	8.0	8.0	7.8	7.9	7.9	7.8	7.8
14	8.3	7.8	8.2	8.1	7.9	8.0	7.9	7.8	7.8	8.1	7.8	7.9
15	8.3	7.9	8.2	8.1	7.9	8.0	7.9	7.8	7.8	8.2	7.7	8.0
16	---	---	---	8.3	8.0	8.1	7.8	7.7	7.8	8.1	7.7	7.9
17	8.1	7.4	8.0	8.4	8.2	8.3	8.0	7.7	7.9	8.1	7.9	8.0
18	8.0	6.8	7.9	8.4	8.0	8.3	8.0	7.9	7.9	8.2	7.9	8.1
19	8.0	7.8	7.9	8.2	8.1	8.2	8.1	7.9	8.0	8.1	7.7	8.0
20	8.0	7.8	7.9	8.2	8.0	8.1	8.3	8.0	8.1	8.1	8.1	8.1
21	7.9	7.8	7.9	8.2	8.0	8.0	8.1	8.0	8.0	8.2	8.1	8.1
22	---	---	---	8.2	8.0	8.1	8.1	8.0	8.0	8.3	8.1	8.1
23	7.8	7.6	7.7	---	---	---	8.1	8.0	8.1	8.4	7.9	8.2
24	7.9	7.7	7.8	---	---	---	8.3	8.0	8.1	8.3	8.1	8.2
25	8.1	7.9	8.0	---	---	---	8.2	8.0	8.1	8.5	8.1	8.2
26	8.1	8.0	8.1	7.8	7.7	7.7	8.2	8.1	8.1	8.4	8.2	8.3
27	8.2	8.1	8.1	7.9	7.7	7.8	8.2	8.1	8.1	8.4	8.2	8.3
28	8.1	8.0	8.1	8.0	7.8	7.9	8.2	8.1	8.1	8.3	8.1	8.2
29	---	---	---	---	---	---	8.2	8.0	8.1	8.2	8.0	8.1
30	8.2	8.0	8.1	---	---	---	8.2	8.0	8.1	8.3	8.0	8.0
31	---	---	---	---	---	---	8.5	8.0	8.2	---	---	---

TEMPERATURE, WATER (DEG. C), WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		OCTOBER			NOVEMBER			DECEMBER			JANUARY	
1	16.5	15.5	16.0	9.5	8.0	9.0	2.0	1.5	2.0	.5	.5	.5
2	16.0	15.5	16.0	8.0	7.0	7.5	2.0	1.5	1.5	1.0	.5	.5
3	15.5	15.0	15.5	7.0	6.5	7.0	2.0	1.5	1.5	1.0	1.0	1.0
4	15.0	14.5	14.5	6.5	6.0	6.5	1.5	.5	1.0	1.5	.5	1.0
5	14.5	14.0	14.5	6.0	5.5	6.0	1.0	.5	.5	1.5	.5	1.5
6	14.0	13.5	13.5	6.0	5.5	5.5	1.0	.5	.5	---	---	---
7	13.5	13.0	13.5	6.5	6.0	6.0	1.0	.5	1.0	1.5	.5	.5
8	13.0	13.0	13.0	5.5	5.0	6.0	1.0	.5	1.0	1.5	.5	.5
9	---	---	---	5.0	3.5	4.0	1.0	.5	1.0	.5	.5	.5
10	---	---	---	4.0	3.0	3.5	1.0	.5	.5	1.0	.5	.5
11	12.0	11.0	11.5	3.0	2.0	2.5	1.0	.5	1.0	1.0	.5	.5
12	---	---	---	2.0	.5	1.0	1.0	.5	1.0	1.5	.5	1.0
13	---	---	---	.5	.5	.5	1.0	.5	1.0	1.5	1.0	1.5
14	---	---	---	1.0	.5	.5	1.0	.5	.5	1.5	1.0	1.5
15	---	---	---	1.0	1.0	1.0	.5	.5	.5	1.0	.5	.5
16	9.0	8.0	8.5	1.0	.5	1.0	.5	.5	.5	1.5	1.0	1.0
17	---	---	---	1.0	.5	.5	1.0	.5	.5	1.0	1.0	1.0
18	---	---	---	.5	.5	.5	1.0	.5	.5	1.0	.5	.5
19	---	---	---	.5	.5	.5	.5	.5	.5	.5	.5	.5
20	---	---	---	1.0	.5	.5	1.0	.5	.5	1.0	1.0	1.0
21	---	---	---	1.0	.5	.5	1.0	.5	.5	1.0	.5	1.0
22	---	---	---	1.0	.5	1.0	1.0	.5	.5	1.0	.5	.5
23	---	---	---	1.0	1.0	1.0	1.5	.5	1.0	---	---	---
24	---	---	---	1.5	.5	1.0	.5	.5	.5	---	---	---
25	12.0	12.0	12.0	1.5	1.0	1.5	1.0	.5	1.0	---	---	---
26	---	---	---	2.0	1.5	2.0	1.5	.5	1.0	---	---	---
27	---	---	---	2.0	1.0	2.0	.5	.5	.5	---	---	---
28	---	---	---	2.0	1.0	2.0	.5	.5	.5	---	---	---
29	11.0	10.5	11.0	2.5	2.0	2.0	.5	.5	.5	---	---	---
30	10.5	10.0	10.5	2.0	2.0	2.0	.5	.5	.5	---	---	---
31	---	---	---	---	---	---	.5	.5	.5	---	---	---
MONTH	---	---	---	9.5	.5	3.0	2.0	.5	1.0	---	---	---

05331560 MISSISSIPPI RIVER AT GREY CLOUD ISLAND NEAR COTTAGE GROVE, MN

TEMPERATURE, WATER (DEG. C), WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		FEBRUARY			MARCH			APRIL			MAY	
1	---	---	---	3.0	2.5	3.0	5.0	4.5	4.5	---	---	---
2	---	---	---	3.0	2.0	2.5	5.0	4.0	4.5	---	---	---
3	---	---	---	3.5	2.0	2.5	5.5	4.0	5.0	---	---	---
4	.5	.5	.5	4.0	3.0	3.5	6.5	4.5	5.5	16.5	15.0	16.0
5	.5	.5	.5	4.5	3.5	4.0	7.5	5.5	6.5	17.0	15.0	16.0
6	.5	.5	.5	6.0	4.0	5.0	8.5	6.5	7.5	17.5	16.0	16.5
7	.5	.5	.5	7.0	5.5	6.0	10.0	8.0	9.0	18.0	16.5	17.0
8	.5	.5	.5	6.5	6.0	6.5	11.0	5.0	10.0	18.5	17.0	18.0
9	.5	.5	.5	6.0	5.0	5.5	10.5	9.0	10.0	19.5	15.5	19.0
10	2.0	1.5	1.5	5.0	3.5	4.5	12.5	10.0	11.0	20.5	19.5	19.5
11	---	---	---	3.5	3.0	3.5	12.5	12.0	12.5	20.5	19.5	20.0
12	---	---	---	3.0	2.5	3.0	13.5	12.0	12.5	21.0	20.0	20.0
13	---	---	---	---	---	---	13.0	12.5	13.0	20.5	18.5	20.0
14	---	---	---	---	---	---	13.5	13.0	13.0	21.0	20.0	20.5
15	2.5	1.5	2.0	---	---	---	13.0	12.0	13.0	21.0	19.5	20.0
16	2.0	1.0	1.5	4.5	3.5	4.5	14.0	12.5	13.0	21.0	19.5	20.5
17	1.5	1.0	1.0	5.0	4.0	4.5	14.5	13.0	13.5	22.0	20.0	21.0
18	---	---	---	5.0	4.5	5.0	15.5	14.0	14.5	21.0	19.5	20.0
19	---	---	---	5.5	5.0	5.0	17.0	15.0	16.0	20.0	19.5	19.5
20	---	---	---	---	---	---	---	---	---	20.5	19.5	20.0
21	---	---	---	---	---	---	16.0	15.0	15.5	20.5	20.0	20.0
22	3.0	2.5	2.5	---	---	---	15.5	14.0	15.0	20.0	18.0	19.0
23	3.0	2.5	3.0	---	---	---	14.5	13.5	14.0	19.0	17.5	18.0
24	3.0	2.5	2.5	8.5	7.5	8.0	15.0	13.0	14.5	18.5	18.0	18.5
25	2.5	2.0	2.5	8.5	8.0	8.5	15.5	14.0	14.5	18.0	17.5	17.5
26	3.0	2.0	2.5	8.5	8.0	8.0	15.5	14.5	15.0	16.5	17.0	17.5
27	3.0	2.5	2.5	8.5	8.0	8.5	16.5	15.0	15.0	19.0	18.0	18.5
28	3.5	2.5	3.0	8.0	7.0	7.5	---	---	---	---	---	---
29	---	---	---	7.0	5.5	6.5	---	---	---	---	---	---
30	---	---	---	5.5	4.5	5.0	---	---	---	---	---	---
31	---	---	---	5.0	4.5	5.0	---	---	---	---	---	---

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		JUNE			JULY			AUGUST			SEPTEMBER	
1	---	---	---	25.0	23.5	24.0	---	---	---	22.0	19.5	20.0
2	---	---	---	25.0	23.5	24.5	---	---	---	21.5	20.0	20.5
3	---	---	---	25.5	24.0	24.5	---	---	---	21.5	20.5	20.5
4	20.5	19.5	20.0	26.0	24.5	25.0	28.0	27.5	27.5	21.5	20.0	20.5
5	22.0	18.5	21.0	25.5	24.5	25.0	---	---	---	22.0	20.5	21.0
6	22.5	21.5	22.0	25.5	24.0	24.5	---	---	---	22.0	21.0	21.5
7	23.5	22.0	22.5	25.5	24.0	25.0	26.5	25.5	26.0	22.5	21.0	21.5
8	23.5	22.5	23.0	26.0	25.0	25.5	26.0	25.0	25.5	21.5	20.5	21.0
9	23.5	22.5	23.0	27.0	25.0	25.5	27.0	24.5	25.0	21.0	20.5	20.5
10	23.0	21.5	22.0	27.0	25.5	26.0	25.5	24.0	25.0	22.0	20.5	20.5
11	22.0	21.0	21.5	27.0	26.0	26.5	25.5	24.5	25.0	21.5	20.0	20.5
12	22.5	21.5	22.0	26.5	25.0	26.5	25.5	24.5	25.0	21.0	20.0	20.5
13	24.0	22.0	23.0	26.0	25.0	25.5	25.0	24.5	25.0	21.0	19.5	20.0
14	25.5	23.5	24.5	25.5	24.5	25.0	25.0	24.5	24.5	20.5	19.0	20.0
15	26.0	21.5	25.0	25.5	24.5	25.0	26.0	24.5	25.0	21.5	19.5	20.5
16	26.5	21.5	25.5	25.0	24.0	24.5	25.0	24.5	25.0	20.5	20.0	20.5
17	26.5	25.0	26.0	26.0	24.5	25.0	25.0	24.5	25.0	20.0	19.5	20.0
18	27.5	25.5	26.0	25.5	24.5	25.5	25.0	24.0	24.5	20.0	19.5	19.5
19	27.0	25.5	26.5	26.5	25.5	26.0	24.5	23.5	24.0	19.5	18.5	19.0
20	26.5	26.0	26.5	27.0	24.5	26.5	24.5	23.5	23.5	19.0	18.5	18.5
21	27.0	26.0	26.5	27.5	26.5	27.0	24.0	23.5	23.5	18.5	17.5	18.0
22	27.0	26.0	26.5	27.5	26.5	27.0	23.0	22.5	23.0	19.0	17.5	18.0
23	27.0	26.5	26.5	---	---	---	22.5	22.0	22.0	19.5	17.5	18.5
24	27.0	26.5	26.5	---	---	---	23.5	21.5	22.0	18.5	17.5	18.0
25	26.5	26.0	26.0	---	---	---	22.0	21.0	21.5	18.5	17.5	18.0
26	26.0	24.5	25.0	27.0	26.5	26.5	21.0	20.0	20.5	19.0	18.0	18.5
27	25.0	24.0	24.0	27.0	26.0	26.5	20.0	19.5	20.0	19.5	18.5	19.0
28	24.5	23.5	24.0	26.5	26.0	26.5	21.0	19.5	20.0	19.5	18.5	19.0
29	---	---	---	---	---	---	20.5	19.5	20.0	19.0	18.5	19.0
30	24.5	23.5	24.0	---	---	---	20.0	19.5	20.0	19.0	17.5	18.5
31	---	---	---	---	---	---	21.0	18.5	19.5	---	---	---
MONTH	---	---	---	---	---	---	---	---	---	22.5	17.5	19.5

05331560 MISSISSIPPI RIVER AT GREY CLOUD ISLAND NEAR COTTAGE GROVE, MN

OXYGEN, DISSOLVED (DO), MG/L, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
	OCTOBER			NOVEMBER			DECEMBER			JANUARY		
1	8.9	8.3	8.6	10.9	10.4	10.7	11.8	10.5	11.2	13.8	12.9	13.2
2	9.1	8.4	8.8	11.2	10.7	10.9	11.8	11.5	11.7	13.5	12.8	13.3
3	8.6	8.1	8.3	11.8	10.8	11.4	12.4	11.4	11.9	13.4	13.0	13.2
4	8.4	8.0	8.2	13.5	11.4	12.7	13.5	12.5	13.0	13.4	12.8	13.1
5	8.7	8.0	8.2	13.1	11.8	12.4	13.7	13.5	13.6	14.1	13.0	13.6
6	9.0	7.9	8.3	13.0	10.7	12.3	13.5	13.2	13.4	13.9	13.0	13.7
7	9.4	8.0	8.4	12.6	11.1	11.7	13.7	13.2	13.5	14.3	13.3	13.9
8	8.7	8.4	8.6	11.1	10.1	10.5	13.7	13.0	13.3	14.1	13.0	13.5
9	---	---	---	11.5	10.9	11.2	13.1	12.9	13.0	13.5	12.8	13.2
10	---	---	---	12.4	11.8	12.1	13.2	12.8	13.0	13.2	12.8	13.0
11	9.8	9.5	9.7	---	---	---	13.3	12.9	13.0	13.4	12.6	13.0
12	10.2	8.5	9.7	---	---	---	13.2	13.0	13.1	14.2	13.2	13.7
13	---	---	---	---	---	---	13.3	13.1	13.2	14.1	12.7	13.6
14	---	---	---	13.5	13.4	13.4	13.3	12.8	13.0	14.2	13.4	13.9
15	---	---	---	13.4	13.2	13.3	13.1	12.7	12.9	13.7	13.2	13.5
16	10.1	9.8	9.9	13.3	13.1	13.2	13.6	12.6	13.2	13.7	13.2	13.4
17	---	---	---	13.3	13.1	13.2	13.9	13.5	13.7	13.6	13.2	13.4
18	---	---	---	13.5	13.1	13.3	13.7	13.2	13.5	13.7	13.2	13.4
19	---	---	---	13.4	12.8	13.2	13.7	13.2	13.5	13.7	13.2	13.3
20	---	---	---	13.5	12.8	13.2	13.5	13.1	13.4	13.8	13.0	13.4
21	---	---	---	13.4	13.2	13.3	13.6	13.1	13.3	13.8	13.1	13.4
22	---	---	---	13.3	13.1	13.2	14.1	13.3	13.8	13.5	12.7	13.2
23	---	---	---	13.2	13.0	13.1	14.1	13.7	13.9	---	---	---
24	---	---	---	13.1	11.6	12.3	13.7	12.6	13.3	---	---	---
25	9.7	8.6	9.1	13.4	11.3	11.5	13.5	13.0	13.3	---	---	---
26	---	---	---	11.6	11.0	11.4	13.6	13.0	13.3	---	---	---
27	---	---	---	11.2	11.0	11.1	13.4	13.0	13.2	---	---	---
28	---	---	---	11.7	11.0	11.2	13.1	12.7	12.9	---	---	---
29	11.3	10.7	10.9	11.0	10.7	10.8	13.1	12.7	12.9	---	---	---
30	11.2	10.5	10.8	10.9	10.6	10.7	13.3	12.6	13.0	---	---	---
31	11.0	9.2	10.6	---	---	---	13.4	12.8	13.1	---	---	---
MONTH	---	---	---	---	---	---	14.1	10.5	13.1	---	---	---

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
	FEBRUARY			MARCH			APRIL			MAY		
1	---	---	---	14.0	13.3	13.6	11.6	11.4	11.5	---	---	---
2	---	---	---	14.0	13.1	13.6	12.0	11.0	11.4	---	---	---
3	---	---	---	14.6	13.2	13.8	12.4	11.2	11.9	---	---	---
4	11.6	10.9	11.2	14.4	13.7	14.1	12.3	11.7	12.0	10.8	9.7	10.2
5	12.6	11.2	11.9	14.3	13.6	14.0	12.1	11.3	11.7	10.8	9.5	10.1
6	13.4	12.2	12.9	14.2	13.1	13.6	12.4	10.8	11.7	11.5	9.4	10.4
7	13.4	12.8	13.1	13.4	12.6	13.0	12.5	11.0	11.8	10.9	9.5	10.3
8	13.3	13.0	13.1	13.0	12.4	12.6	12.0	10.7	11.4	10.7	8.8	9.8
9	14.3	12.7	13.6	12.6	11.9	12.3	12.1	9.8	11.1	10.2	8.6	9.4
10	14.5	13.3	14.1	13.3	12.1	12.6	12.4	10.0	11.3	9.3	7.9	8.6
11	14.4	12.9	13.6	13.7	12.7	13.2	12.0	10.4	11.2	9.5	7.4	8.4
12	13.3	12.8	13.1	13.8	13.1	13.4	12.2	10.2	11.2	9.0	7.4	8.3
13	13.7	12.5	13.5	---	---	---	12.8	10.3	11.6	8.6	6.3	7.3
14	13.8	13.4	13.6	---	---	---	12.2	10.9	11.5	---	---	---
15	13.9	13.2	13.5	---	---	---	11.2	9.9	10.5	9.0	6.5	7.7
16	14.4	13.4	13.9	---	---	---	11.7	9.6	10.5	9.0	6.6	7.8
17	14.1	13.6	13.9	---	---	---	12.0	10.0	11.0	8.3	7.1	7.8
18	14.9	13.4	14.3	12.5	11.9	12.2	12.5	10.5	11.4	8.3	6.4	7.1
19	14.7	13.2	14.2	12.0	11.5	11.8	11.8	10.0	10.9	6.4	5.0	5.6
20	14.4	13.4	14.1	---	---	---	11.1	9.6	10.4	5.4	5.0	5.2
21	14.2	13.4	13.8	---	---	---	10.8	8.8	9.8	7.0	4.3	5.6
22	13.7	13.0	13.3	---	---	---	9.7	8.5	9.1	6.8	6.4	6.6
23	14.0	12.7	13.4	---	---	---	9.7	8.0	8.6	9.2	7.7	7.9
24	14.3	13.5	13.9	11.2	10.0	10.8	10.6	8.6	9.6	9.3	7.8	8.6
25	14.3	12.5	13.3	11.6	10.5	11.2	10.6	8.5	9.5	9.3	8.4	8.8
26	---	---	---	11.4	11.0	11.3	10.3	8.6	9.5	8.5	7.7	8.0
27	14.6	14.0	14.3	11.4	10.7	11.1	11.7	8.5	9.7	8.7	7.7	8.3
28	14.4	13.9	14.2	11.5	10.9	11.2	---	---	---	---	---	---
29	---	---	---	11.6	11.1	11.4	---	---	---	---	---	---
30	---	---	---	11.4	10.6	11.1	---	---	---	---	---	---
31	---	---	---	11.0	10.2	10.6	---	---	---	---	---	---

05331560 MISSISSIPPI RIVER AT GREY CLOUD ISLAND NEAR COTTAGE GROVE, MN

OXYGEN, DISSOLVED (DO), MG/L, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		JUNE			JULY			AUGUST			SEPTEMBER	
1	---	---	---	9.2	7.0	7.9	---	---	---	9.2	6.9	8.5
2	---	---	---	8.7	7.1	7.9	---	---	---	8.3	7.3	8.3
3	---	---	---	7.8	6.5	7.3	---	---	---	8.9	8.0	8.4
4	9.1	7.6	8.2	7.3	5.7	6.4	7.3	5.7	6.5	8.4	7.6	8.1
5	9.0	7.7	8.2	7.6	5.6	6.6	---	---	---	8.3	7.7	8.0
6	9.9	7.5	8.8	7.7	6.6	7.1	---	---	---	8.2	7.4	7.8
7	9.5	7.6	8.5	7.2	5.1	5.8	6.7	5.5	6.2	8.3	7.2	7.7
8	8.5	6.7	7.7	7.0	4.2	5.8	6.5	5.8	6.1	7.9	7.1	7.5
9	8.7	6.6	7.7	8.0	5.7	6.7	6.9	5.6	5.8	7.7	7.1	7.3
10	8.0	6.8	7.3	8.5	6.4	7.4	6.7	5.5	6.1	8.0	6.6	7.0
11	8.8	6.0	7.6	7.9	5.5	6.7	6.7	6.0	6.3	7.2	6.4	6.7
12	9.6	7.1	8.5	---	---	---	7.1	6.6	6.9	6.7	6.0	6.4
13	9.3	7.6	8.5	7.2	5.0	6.1	6.7	5.6	6.1	6.8	5.8	6.3
14	9.3	7.1	8.3	7.3	5.3	6.1	6.8	6.6	6.7	7.6	5.6	6.5
15	9.3	7.7	8.5	7.1	5.0	5.9	6.6	5.5	6.2	8.0	6.7	7.3
16	9.0	7.4	8.3	7.2	5.9	6.4	6.4	5.7	6.1	7.8	6.1	6.3
17	8.4	6.6	7.3	7.7	5.7	6.8	8.4	6.2	8.0	6.6	6.1	6.4
18	7.6	4.5	6.2	7.0	5.2	6.1	8.1	5.3	7.8	---	---	---
19	7.0	5.2	6.3	---	---	---	7.9	6.5	7.2	8.0	7.1	7.5
20	6.8	5.3	6.1	7.8	5.4	6.6	7.3	6.7	7.0	8.2	7.4	7.8
21	6.4	5.5	5.9	7.5	5.9	6.7	6.9	6.5	6.6	8.2	7.8	8.0
22	7.0	5.4	6.2	6.9	5.5	6.4	7.0	6.4	6.7	8.7	7.4	8.0
23	6.5	5.3	5.9	---	---	---	7.2	6.4	6.8	8.9	7.9	8.3
24	6.3	5.1	5.8	---	---	---	7.2	6.5	6.8	9.0	8.1	8.5
25	7.4	5.1	6.3	---	---	---	7.1	6.5	6.8	9.4	6.3	8.9
26	8.2	6.4	7.2	6.7	5.6	6.2	7.1	6.9	7.0	9.2	8.5	8.8
27	8.1	6.5	7.3	6.7	4.9	5.8	7.4	6.9	7.1	9.0	8.1	8.6
28	7.9	6.2	7.0	6.9	6.0	6.6	7.7	6.8	7.2	8.7	8.0	8.4
29	---	---	---	---	---	---	8.0	7.3	7.6	8.8	7.6	8.3
30	8.5	7.4	7.8	---	---	---	8.3	7.6	7.9	8.8	7.4	8.0
31	---	---	---	---	---	---	8.7	7.9	8.3	---	---	---

05331570 MISSISSIPPI RIVER AT NININGER, MN
(National stream-quality accounting network station)

WATER-QUALITY RECORDS

LOCATION.--Lat 44°46'22", long 92°54'07", in NW¼NE¼ sec.18, T.115 N., R.17 W., Dakota County, Hydrologic Unit 07010206, on right bank at the end of Jason Avenue, and at mile 817.8 (1,316 km) upstream from Ohio River.

DRAINAGE AREA.--37,000 mi^2 (95,800 km^2), approximately.

PERIOD OF RECORD.--January 1977 to current year.

REMARKS.--Water-discharge computed on the basis of discharge for Mississippi River at St. Paul (station 05331000) adjusted for inflow and travel time. Letter K indicates non-ideal colony count.

WATER QUALITY DATA, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	TIME	DIS-CHARGE, IN CUBIC FEET PER SECOND (00060)	SPE-CIFIC CON-DUCT-ANCE (US/CM) (00095)	SPE-CIFIC CON-DUCT-ANCE LAB (US/CM) (90095)	PH (STAND-ARD UNITS) (00400)	PH LAB (STAND-ARD UNITS) (00403)	TEMPER-ATURE AIR (DEG C) (00020)	TEMPER-ATURE WATER (DEG C) (00010)	TUR-BID-ITY (NTU) (00076)	BARO-METRIC PRES-SURE (MM OF HG) (00025)	OXYGEN, DIS-SOLVED (MG/L) (00300)	COLI-FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML) (31625)
DEC												
15...	1130	11100	620	630	8.2	8.1	-5.0	1.0	2.6	772	13.9	140
FEB												
20...	0915	9500	544	575	8.4	8.0	0.0	0.5	2.5	775	14.6	K2900
APR												
30...	1045	11600	633	689	8.8	7.8	13.5	16.5	12	773	13.4	K14
AUG												
20...	1100	6830	480	483	8.3	8.1	26.0	24.0	15	771	7.7	E80

DATE	STREP-TOCOCCI FECAL, KF AGAR (COLS. PER 100 ML) (31673)	CALCIUM DIS-SOLVED (MG/L AS CA) (00915)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG) (00925)	SODIUM, DIS-SOLVED (MG/L AS NA) (00930)	POTAS-SIUM, DIS-SOLVED (MG/L AS K) (00935)	ALKA-LINITY WATER DISSOLV FLD. AS CACO3 (MG/L) (39086)	CAR-BONATE WATER DISSOLV FIELD AS CO3 (MG/L) (00452)	BICAR-BONATE WATER DISSOLV FIELD AS HCO3 (MG/L) (00453)	SULFATE DIS-SOLVED (MG/L AS SO4) (00945)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL) (00940)	FLUO-RIDE, DIS-SOLVED (MG/L AS F) (00950)
DEC											
15...	160	77	30	18	3.4	243	0	296	77	22	0.3
FEB											
20...	1400	68	26	18	3.3	221	1	267	55	21	0.2
APR											
30...	--	68	37	20	3.8	200	14	215	120	23	0.3
AUG											
20...	K6	53	21	19	3.8	172	0	210	44	23	0.3

05331570 MISSISSIPPI RIVER AT NININGER, MN--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	SILICA, DIS-SOLVED (MG/L AS SIO2) (00955)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L) (70300)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N) (00631)	NITRO-GEN, AMMONIA DIS-SOLVED (MG/L AS N) (00608)	NITRO-GEN, AM-MONIA + ORGANIC TOTAL (MG/L AS N) (00625)	PHOS-PHORUS, TOTAL (MG/L AS P) (00665)	PHOS-PHORUS, DIS-SOLVED (MG/L AS P) (00666)	PHOS-PHORUS, ORTHO, DIS-SOLVED (MG/L AS P) (00671)	SEDI-MENT, SUS-PENDED (MG/L) (80154)	SEDI-MENT, DIS-CHARGE, SUS-PENDED (T/DAY) (80155)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM (70331)
DEC											
15...	15	402	2.4	0.82	2.1	0.12	0.09	0.08	--	--	--
FEB											
20...	12	350	1.2	0.71	1.7	0.20	0.14	0.11	4	103	83
APR											
30...	1.4	409	1.2	0.15	2.1	0.19	0.03	0.01	45	1410	100
AUG											
20...	14	296	1.2	0.12	0.50	0.31	0.20	0.15	49	904	82

DATE	TIME	ALUM-INUM, DIS-SOLVED (UG/L AS AL) (01106)	ARSENIC DIS-SOLVED (UG/L AS AS) (01000)	BARIUM, DIS-SOLVED (UG/L AS BA) (01005)	BERYL-LIUM, DIS-SOLVED (UG/L AS BE) (01010)	CADMIUM DIS-SOLVED (UG/L AS CD) (01025)	CHRO-MIUM, DIS-SOLVED (UG/L AS CR) (01030)	COBALT, DIS-SOLVED (UG/L AS CO) (01035)	COPPER, DIS-SOLVED (UG/L AS CU) (01040)	IRON, DIS-SOLVED (UG/L AS FE) (01046)	LEAD, DIS-SOLVED (UG/L AS PB) (01049)
DEC											
15...	1130	<10	1	60	<0.5	1	<1	<3	1	38	<5
FEB											
20...	0915	<10	1	57	<0.5	<1	<1	<3	1	16	<5
APR											
30...	1045	<10	<1	59	<0.5	<1	<1	<3	2	9	<5
AUG											
20...	1100	<10	3	55	<0.5	<1	<1	<3	2	6	<5

DATE	LITHIUM DIS-SOLVED (UG/L AS LI) (01130)	MANGA-NESE, DIS-SOLVED (UG/L AS MN) (01056)	MERCURY DIS-SOLVED (UG/L AS HG) (71890)	MOLYB-DENUM, DIS-SOLVED (UG/L AS MO) (01060)	NICKEL, DIS-SOLVED (UG/L AS NI) (01065)	SELE-NIUM, DIS-SOLVED (UG/L AS SE) (01145)	SILVER, DIS-SOLVED (UG/L AS AG) (01075)	STRON-TIUM, DIS-SOLVED (UG/L AS SR) (01080)	VANA-DIUM, DIS-SOLVED (UG/L AS V) (01085)	ZINC, DIS-SOLVED (UG/L AS ZN) (01090)
DEC										
15...	27	54	0.2	<10	1	1	<1	190	<6	<3
FEB										
20...	20	67	<0.1	<10	3	<1	<1	170	<6	31
APR										
30...	24	16	<0.1	<10	2	1	<1	240	<6	8
AUG										
20...	12	3	<0.1	<10	6	3	<1	140	<6	<3

MISSISSIPPI RIVER MAIN STEM

05331578 MISSISSIPPI RIVER AT LOCK AND DAM 2 AT HASTINGS, MN

LOCATION.--Lat 44°45'37", long 92°52'02", in SE¼SW¼ sec.16, T.115 N., R.17 W., Dakota County, Hydrologic Unit 07010206, in old lock house at lock and dam and at mile 815.2 upstream from Ohio River.

PERIOD OF RECORD.--Water years 1975 to current year.

PERIOD OF DAILY RECORD.--
SPECIFIC CONDUCTANCE: October 1974 to current year.
pH: October 1974 to current year.
WATER TEMPERATURES: October 1974 to current year.
DISSOLVED OXYGEN: October 1974 to current year.

INSTRUMENTATION.--Water-quality monitor since October 1974.

REMARKS.--Extremes are published for those years with 80 percent or more daily record.

COOPERATION.--Water-quality monitor is operated by the Metropolitan Waste Control Commission, St. Paul, MN.

EXTREMES FOR PERIOD OF DAILY RECORD.--
SPECIFIC CONDUCTANCE (water years 1980, 1982, 1987): Maximum, 799 microsiemens June 27, July 6, 20, 1980; minimum, (more than 20 percent missing record), 268 microsiemens Sep. 20, 1986.
pH (water years 1980, 1982, 1987): Maximum, 8.9 units Aug. 1, 1980, Apr. 11, 1987; minimum, 6.7 units Jan. 23, 27, 1982.
WATER TEMPERATURES (water years 1980, 1983-84, 1987): Maximum, 32.5°C July 10, 1980; minimum, 0.0°C several days during winter period.
DISSOLVED OXYGEN (water years 1980, 1982, 1987): Maximum, 19.2 mg/L Oct. 16, 1979; minimum, 1.7 mg/L June 4, 1980.

EXTREMES FOR CURRENT YEAR.--
SPECIFIC CONDUCTANCE: Maximum, 714 microsiemens Oct. 6; minimum, 371 microsiemens July 25.
pH: Maximum, 8.9 units Apr. 11; minimum, 7.1 units July 25, 28.
WATER TEMPERATURES: Maximum, 29.0°C July 31, Aug. 1; minimum, 0.0°C several days during winter period.
DISSOLVED OXYGEN: Maximum, 16.8 mg/L Feb. 18; minimum, 4.0 mg/L Aug. 5.

SPECIFIC CONDUCTANCE (MICROSIEMENS/CM AT 25 DEG. C), WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		OCTOBER			NOVEMBER			DECEMBER			JANUARY	
1	538	405	476	690	626	668	594	572	581	624	621	622
2	572	495	533	710	599	658	606	566	582	624	623	623
3	593	534	555	648	586	613	602	562	585	624	623	623
4	614	552	591	---	---	---	582	510	540	624	621	622
5	641	579	601	586	514	557	551	523	537	623	601	622
6	714	603	651	569	481	532	542	516	527	624	573	595
7	676	559	620	540	491	517	551	523	537	624	573	575
8	645	560	616	602	494	566	564	535	549	575	572	573
9	---	---	---	621	599	610	554	515	538	576	573	574
10	---	---	---	---	---	---	---	---	---	576	574	574
11	---	---	---	---	---	---	---	---	---	576	574	574
12	---	---	---	---	---	---	---	---	---	576	574	574
13	---	---	---	---	---	---	---	---	---	604	573	589
14	614	513	563	---	---	---	---	---	---	604	575	602
15	620	520	573	---	---	---	---	---	---	603	575	601
16	596	451	537	---	---	---	---	---	---	604	602	602
17	617	534	581	---	---	---	---	---	---	604	602	602
18	621	486	570	551	485	502	---	---	---	604	602	603
19	619	443	543	---	---	---	603	601	601	603	602	602
20	---	---	---	535	516	529	630	602	611	604	601	602
21	---	---	---	538	511	524	602	587	598	604	602	602
22	---	---	---	532	504	516	602	601	601	602	600	601
23	---	---	---	536	512	526	614	601	607	603	600	601
24	575	518	556	530	499	515	612	610	610	604	602	602
25	584	514	547	606	508	560	611	610	610	604	601	602
26	599	508	557	608	572	586	612	610	610	603	602	602
27	---	---	---	592	571	581	612	610	610	649	602	627
28	598	572	585	595	511	583	611	610	610	650	603	648
29	631	552	592	597	571	585	611	610	610	650	648	648
30	---	---	---	596	572	583	624	610	617	650	603	647
31	626	403	569	---	---	---	624	621	622	650	648	648
MONTH	---	---	---	---	---	---	---	---	---	650	572	606

MISSISSIPPI RIVER MAIN STEM

05331578 MISSISSIPPI RIVER AT LOCK AND DAM 2 AT HASTINGS, MN

SPECIFIC CONDUCTANCE (MICROSIEMENS/CM AT 25 DEG. C), WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		FEBRUARY			MARCH			APRIL			MAY	
1	650	648	649	542	535	539	580	544	565	636	606	616
2	650	646	648	558	540	545	---	---	---	633	612	625
3	649	589	616	575	539	547	620	589	608	642	615	633
4	591	590	590	564	549	557	637	614	624	629	592	609
5	648	590	591	---	---	---	660	637	649	618	545	584
6	648	590	591	---	---	---	651	644	647	---	---	---
7	591	589	590	---	---	---	702	644	680	---	---	---
8	591	589	590	---	---	---	695	614	679	582	536	569
9	591	589	590	---	---	---	674	652	664	587	545	568
10	591	568	579	564	545	556	668	643	659	582	559	570
11	571	560	564	560	544	550	663	645	655	---	---	---
12	563	557	558	565	539	541	656	629	645	596	567	577
13	561	558	559	544	538	541	641	627	634	613	563	589
14	561	553	556	563	536	545	---	---	---	---	---	---
15	554	551	552	---	---	---	---	---	---	599	590	594
16	554	550	552	556	525	546	624	610	618	596	591	593
17	559	538	544	547	540	543	616	598	609	602	587	594
18	556	536	539	550	544	547	632	582	602	606	595	601
19	553	542	545	554	540	550	605	580	597	596	590	592
20	542	537	539	556	539	550	---	---	---	595	580	584
21	538	534	536	561	554	558	---	---	---	583	577	580
22	538	534	536	563	555	558	---	---	---	583	557	569
23	543	538	540	582	549	568	639	627	631	562	554	559
24	542	538	540	572	559	563	643	591	637	563	535	553
25	545	536	539	564	549	558	638	601	629	547	406	519
26	550	539	543	549	531	538	635	595	620	494	450	473
27	552	538	543	535	515	526	638	605	627	[illegible]	435	447
28	551	541	546	531	516	521	645	608	628	---	---	---
29	---	---	---	563	528	542	621	595	608	---	---	---
30	---	---	---	584	561	569	621	598	608	---	---	---
31	---	---	---	603	524	561	---	---	---	---	---	---
MONTH	650	534	567	---	---	---	---	---	---	---	---	---

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		JUNE			JULY			AUGUST			SEPTEMBER	
1	---	---	---	615	589	604	577	528	533	554	508	536
2	---	---	---	600	589	593	529	506	521	558	514	544
3	---	---	---	606	599	601	519	495	510	557	523	549
4	484	449	469	616	601	610	502	450	477	559	555	556
5	507	484	495	621	611	615	451	447	448	559	555	557
6	---	---	---	625	614	621	522	443	445	569	541	555
7	547	529	533	624	611	620	---	---	---	553	545	550
8	556	531	527	622	600	615	---	---	---	561	548	554
9	598	540	559	613	558	580	---	---	---	571	548	562
10	585	558	568	571	541	556	---	---	---	575	543	571
11	586	566	578	621	556	567	---	---	---	572	565	568
12	580	569	575	600	577	585	496	462	479	569	564	566
13	573	561	568	614	588	600	492	473	484	573	563	567
14	576	567	571	613	591	604	500	487	496	571	547	562
15	573	559	565	594	585	590	503	461	496	611	553	593
16	---	---	---	---	---	---	501	496	498	616	535	607
17	580	545	573	589	582	585	502	498	500	623	601	615
18	584	575	579	615	587	599	507	492	501	606	583	595
19	588	578	583	626	611	619	497	469	489	586	500	543
20	---	---	---	642	623	630	486	471	480	552	528	540
21	---	---	---	655	625	635	501	486	494	537	528	533
22	583	572	577	648	626	638	507	494	501	510	507	508
23	596	583	588	---	---	---	512	505	508	607	503	510
24	595	586	591	558	503	535	523	510	515	502	493	498
25	631	594	607	523	371	462	513	505	507	525	481	492
26	647	614	628	465	385	422	513	505	508	486	475	480
27	656	644	649	---	---	---	519	511	514	512	464	475
28	677	649	664	557	448	484	518	510	514	479	465	472
29	660	644	651	---	---	---	523	511	518	484	471	478
30	643	607	620	536	523	526	523	518	520	477	470	472
31	---	---	---	---	---	---	521	511	517	---	---	---
MONTH	---	---	---	---	---	---	---	---	---	623	464	540

MISSISSIPPI RIVER MAIN STEM

05331578 MISSISSIPPI RIVER AT LOCK AND DAM 2 AT HASTINGS, MN

PH (STANDARD UNITS), WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		OCTOBER			NOVEMBER			DECEMBER			JANUARY	
1	7.7	7.6	7.7	8.3	8.2	8.3	8.0	7.8	7.9	7.9	7.8	7.8
2	7.8	7.7	7.7	8.4	8.1	8.3	8.0	7.9	7.9	7.9	7.8	7.8
3	7.9	7.7	7.8	8.4	8.3	8.3	8.0	7.8	8.0	7.9	7.8	7.8
4	7.9	7.8	7.9	8.3	8.1	8.2	8.2	7.9	8.1	7.9	7.8	7.8
5	8.1	7.9	8.0	8.2	8.1	8.1	8.1	8.0	8.1	8.0	7.8	7.9
6	8.1	8.0	8.1	8.2	8.1	8.1	8.0	7.9	8.0	7.9	7.8	7.9
7	8.1	8.0	8.1	8.2	8.1	8.1	8.0	7.9	7.9	7.9	7.8	7.9
8	8.2	8.1	8.1	8.2	8.0	8.1	8.0	7.9	7.9	8.0	7.8	7.9
9	8.2	8.2	8.2	8.3	8.1	8.2	7.9	7.9	7.9	8.0	7.9	8.0
10	8.2	8.2	8.2	8.3	8.2	8.2	8.0	7.8	7.9	8.0	7.9	8.0
11	8.4	8.2	8.3	8.3	8.2	8.3	8.0	8.0	8.0	8.1	8.0	8.0
12	8.3	8.0	8.2	---	---	---	---	---	---	8.1	7.9	8.0
13	8.2	8.1	8.1	---	---	---	---	---	---	8.1	7.9	8.0
14	8.1	8.1	8.1	---	---	---	---	---	---	8.0	7.9	7.9
15	8.1	8.1	8.1	8.0	7.9	8.0	---	---	---	8.1	7.9	8.0
16	8.1	8.0	8.1	7.9	7.8	7.9	---	---	---	8.0	7.8	7.9
17	8.1	8.0	8.1	7.9	7.8	7.8	---	---	---	8.0	7.9	7.9
18	8.1	8.1	8.1	7.8	7.8	7.8	---	---	---	7.9	7.8	7.8
19	8.1	8.1	8.1	7.9	7.6	7.7	7.9	7.8	7.8	7.9	7.7	7.8
20	---	---	---	7.9	7.6	7.6	7.9	7.8	7.9	7.8	7.7	7.8
21	---	---	---	7.6	7.6	7.6	7.9	7.8	7.9	7.8	7.7	7.7
22	---	---	---	7.6	7.5	7.6	7.9	7.8	7.9	8.0	7.7	7.8
23	---	---	---	7.7	7.6	7.6	8.1	7.8	8.0	7.9	7.8	7.8
24	8.1	8.0	8.1	7.7	7.6	7.6	8.1	7.9	8.0	7.9	7.7	7.8
25	8.1	8.0	8.1	7.8	7.6	7.8	8.0	7.9	8.0	7.8	7.7	7.8
26	8.2	8.1	8.1	7.9	7.8	7.8	8.0	7.9	7.9	7.8	7.7	7.8
27	8.1	8.1	8.1	7.8	7.6	7.8	8.0	7.9	7.9	7.8	7.7	7.8
28	8.2	8.1	8.1	7.9	7.8	7.8	8.0	7.9	7.9	7.9	7.6	7.6
29	8.2	8.1	8.2	7.9	7.8	7.8	7.9	7.8	7.9	7.7	7.5	7.5
30	8.3	8.1	8.2	8.0	7.8	7.9	7.9	7.8	7.9	7.8	7.3	7.4
31	8.2	8.1	8.2	---	---	---	7.9	7.8	7.9	---	---	---

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		FEBRUARY			MARCH			APRIL			MAY	
1	7.7	7.6	7.6	7.9	7.7	7.8	---	---	---	8.4	7.8	7.8
2	7.9	7.6	7.7	8.0	7.8	7.9	---	---	---	8.1	7.7	7.8
3	7.9	7.7	7.8	8.1	7.8	8.0	7.9	7.8	7.8	8.2	7.8	8.0
4	8.0	7.8	7.9	8.0	7.8	7.9	7.9	7.7	7.8	8.7	8.0	8.3
5	8.0	7.9	8.0	---	---	---	8.0	7.7	7.9	8.6	8.2	8.3
6	8.0	7.9	7.9	---	---	---	8.1	7.8	8.0	---	---	---
7	8.0	7.8	8.0	---	---	---	8.5	7.9	8.2	---	---	---
8	8.1	7.9	8.0	---	---	---	8.7	8.3	8.4	8.5	8.1	8.3
9	8.1	7.9	8.0	---	---	---	8.7	8.3	8.5	---	---	---
10	8.1	7.8	8.0	8.1	7.8	7.9	8.8	8.4	8.5	---	---	---
11	7.9	7.8	7.9	8.2	7.9	8.0	8.9	8.5	8.6	---	---	---
12	8.0	7.9	7.9	8.2	8.0	7.9	8.8	8.4	8.6	8.5	8.0	8.2
13	8.0	7.9	7.9	8.1	7.8	7.9	8.8	8.4	8.6	8.2	7.9	8.1
14	8.1	8.0	8.0	8.0	7.7	7.8	---	---	---	---	---	---
15	8.3	8.1	8.1	---	---	---	---	---	---	8.1	7.6	7.9
16	8.4	8.2	8.3	8.2	7.7	8.0	---	---	---	8.2	7.7	7.9
17	8.4	7.9	8.2	8.2	7.8	8.0	8.6	8.3	8.5	8.6	7.7	8.1
18	8.3	8.0	8.2	8.1	7.9	8.0	8.6	8.3	8.4	8.2	7.7	7.9
19	8.2	8.1	8.1	8.1	7.9	8.0	8.4	8.2	8.3	7.8	7.5	7.6
20	8.1	8.0	8.1	8.5	8.0	8.2	---	---	---	8.0	7.4	7.5
21	8.1	8.0	8.1	8.2	7.8	7.9	---	---	---	7.6	7.2	7.3
22	8.1	7.9	8.0	8.1	7.7	8.0	---	---	---	7.4	7.2	7.3
23	8.1	7.9	8.0	8.0	7.8	7.9	8.8	8.1	8.5	7.9	7.2	7.5
24	8.0	7.9	8.0	8.2	7.9	8.1	8.6	8.2	8.4	8.1	7.4	7.7
25	8.1	7.8	7.9	8.2	7.9	8.0	8.6	8.3	8.4	8.0	7.7	7.8
26	8.0	7.7	7.9	8.2	7.7	7.9	8.7	8.4	8.5	8.2	7.7	7.9
27	8.0	7.9	8.0	8.2	7.7	7.9	8.6	8.3	8.5	8.2	7.9	8.0
28	8.1	7.7	7.9	8.2	7.8	8.0	8.6	8.1	8.3	---	---	---
29	---	---	---	8.0	7.9	7.9	8.4	8.0	8.2	---	---	---
30	---	---	---	8.0	7.8	7.9	8.4	7.9	8.1	---	---	---
31	---	---	---	7.9	7.7	7.8	---	---	---	---	---	---
MONTH	8.4	7.6	8.0	---	---	---	---	---	---	---	---	---

MISSISSIPPI RIVER MAIN STEM

05331578 MISSISSIPPI RIVER AT LOCK AND DAM 2 AT HASTINGS, MN

PH (STANDARD UNITS), WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		JUNE			JULY			AUGUST			SEPTEMBER	
1	---	---	---	8.4	7.7	8.1	8.6	8.0	8.3	8.3	7.7	8.0
2	---	---	---	8.3	8.1	8.2	8.6	7.8	8.1	8.4	7.9	8.0
3	---	---	---	8.3	8.1	8.1	8.2	7.7	7.9	8.3	7.9	8.1
4	8.3	7.9	8.1	8.3	8.0	8.1	7.8	7.5	7.6	8.3	8.0	8.2
5	8.3	7.9	8.1	8.2	7.9	8.0	7.8	7.3	7.6	8.3	8.0	8.2
6	---	---	---	8.3	7.6	7.9	8.3	7.4	7.5	8.5	7.7	8.2
7	8.6	8.0	8.3	8.5	7.8	8.1	---	---	---	8.3	7.8	8.0
8	8.6	8.1	8.3	8.4	7.8	8.1	---	---	---	8.3	7.8	8.1
9	---	---	---	8.3	7.7	8.1	---	---	---	8.2	7.7	7.8
10	7.9	7.9	7.9	8.8	8.0	8.4	---	---	---	7.8	7.6	7.7
11	8.0	7.6	7.8	8.6	7.7	8.0	---	---	---	8.0	7.6	7.7
12	8.1	7.7	7.9	7.7	7.3	7.5	8.1	7.7	7.8	7.8	7.6	7.6
13	8.5	7.6	8.0	7.8	7.3	7.6	8.0	7.4	7.7	7.9	7.5	7.7
14	8.2	7.6	7.9	8.4	7.5	7.8	7.8	7.4	7.5	7.8	7.3	7.5
15	8.0	7.5	7.8	8.7	8.0	8.2	7.5	7.2	7.3	8.2	7.6	7.7
16	---	---	---	---	---	---	7.5	7.2	7.3	8.2	7.8	7.9
17	8.0	7.7	7.8	8.3	8.0	8.1	8.1	7.3	7.7	7.9	7.8	7.8
18	8.2	7.5	7.7	8.1	7.9	8.0	8.1	7.6	7.8	8.0	7.7	7.8
19	8.0	7.4	7.6	8.4	7.8	8.0	8.4	7.3	8.0	7.9	7.7	7.8
20	---	---	---	8.2	7.8	8.0	8.2	7.7	8.0	8.1	7.8	8.0
21	---	---	---	8.2	7.8	8.0	8.0	7.6	7.8	8.1	7.8	8.0
22	8.0	7.3	7.5	---	---	---	7.7	7.4	7.6	8.4	7.8	8.1
23	8.2	7.5	7.7	---	---	---	7.7	7.4	7.5	8.4	8.0	8.1
24	7.9	7.4	7.6	7.9	7.7	7.8	7.6	7.3	7.4	8.2	8.1	8.1
25	7.9	7.5	7.7	7.7	7.1	7.4	8.2	7.2	7.8	8.7	8.1	8.3
26	8.1	7.7	7.9	---	---	---	8.1	7.8	7.9	8.7	8.4	8.5
27	8.1	7.8	8.0	---	---	---	7.9	7.7	7.8	8.6	8.1	8.5
28	8.4	7.8	8.1	8.1	7.1	7.6	8.2	7.5	7.8	8.7	8.4	8.5
29	8.3	7.9	8.1	---	---	---	8.1	7.8	7.9	8.7	8.1	8.4
30	---	---	---	---	---	---	8.4	7.9	8.1	8.6	8.3	8.4
31	---	---	---	---	---	---	8.4	8.1	8.2	---	---	---
MONTH	---	---	---	---	---	---	---	---	---	8.7	7.3	8.0

TEMPERATURE, WATER (DEG. C), WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		OCTOBER			NOVEMBER			DECEMBER			JANUARY	
1	16.5	15.5	16.0	10.5	9.5	10.0	.5	.0	.5	.5	.5	.5
2	16.0	15.5	15.5	11.0	9.0	9.5	.5	.5	.5	.5	.5	.5
3	16.0	15.5	15.5	9.5	9.0	9.5	.5	.0	.0	.5	.5	.5
4	15.5	15.0	15.0	10.5	6.0	7.5	.5	.0	.5	.5	.5	.5
5	15.5	15.0	15.0	7.0	6.0	6.0	.5	.5	.5	.5	.5	.5
6	15.0	14.5	14.5	6.0	6.0	6.0	.5	.5	.5	.5	.5	.5
7	15.0	13.0	14.0	6.5	6.0	6.0	.5	.5	.5	.5	.5	.5
8	13.5	12.5	13.0	6.5	5.0	6.0	.5	.5	.5	.5	.5	.5
9	13.0	12.5	12.5	5.0	4.0	4.5	.5	.5	.5	.5	.5	.5
10	12.5	12.0	12.5	4.5	4.0	4.5	.5	.5	.5	.5	.5	.5
11	12.5	11.5	12.0	4.0	4.0	4.0	.5	.5	.5	.5	.5	.5
12	---	---	---	---	---	---	---	---	---	.5	.5	.5
13	11.5	11.0	11.5	---	---	---	---	---	---	.5	.5	.5
14	11.5	8.5	10.0	---	---	---	---	---	---	.5	.5	.5
15	9.0	9.0	9.0	3.0	3.0	3.0	---	---	---	.5	.0	.5
16	9.5	9.0	9.0	3.0	3.0	3.0	---	---	---	.5	.0	.5
17	9.0	8.5	9.0	3.0	3.0	3.0	---	---	---	.5	.5	.5
18	9.0	8.5	9.0	3.0	.0	1.5	---	---	---	.5	.0	.5
19	9.5	9.0	9.0	.0	.0	.0	.5	.5	.5	.5	.0	.5
20	---	---	---	.0	.0	.0	.5	.5	.5	.5	.0	.5
21	---	---	---	.0	.0	.0	.5	.5	.5	.5	.0	.5
22	---	---	---	.0	.0	.0	.5	.5	.5	.5	.0	.0
23	---	---	---	.0	.0	.0	.5	.0	.5	.5	.0	.5
24	10.0	10.0	10.0	.0	.0	.0	.5	.0	.5	.5	.5	.5
25	10.0	10.0	10.0	.0	.0	.0	.5	.0	.0	.5	.0	.5
26	10.0	10.0	10.0	.0	.0	.0	.5	.0	.5	.5	.5	.5
27	10.0	10.0	10.0	.5	.0	.5	.5	.0	.5	.5	.5	.5
28	11.0	10.0	10.5	.5	.0	.5	.5	.0	.0	.5	.5	.5
29	11.0	10.5	11.0	.5	.5	.5	.5	.0	.0	.5	.5	.5
30	10.5	10.0	10.5	.5	.0	.5	.5	.0	.5	.5	.0	.0
31	10.5	10.0	10.5	---	---	---	.5	.5	.5	.5	.0	.5
MONTH	---	---	---	---	---	---	---	---	---	.5	.0	.5

MISSISSIPPI RIVER MAIN STEM

05331578 MISSISSIPPI RIVER AT LOCK AND DAM 2 AT HASTINGS, MN

TEMPERATURE, WATER (DEG. C), WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		FEBRUARY			MARCH			APRIL			MAY	
1	.5	.0	.5	1.5	1.0	1.0	5.5	5.0	5.0	15.0	14.5	15.0
2	.5	.0	.5	1.5	1.5	1.0	---	---	---	15.0	14.5	14.5
3	.5	.0	.5	2.0	1.0	1.5	5.5	5.0	5.5	15.0	15.0	15.0
4	.5	.5	.5	2.0	1.5	1.5	6.5	5.0	5.5	15.5	14.5	15.0
5	.5	.0	.5	---	---	---	6.5	5.5	6.0	17.0	15.0	16.0
6	.5	.5	.5	---	---	---	7.0	6.0	6.5	---	---	---
7	.5	.5	.5	---	---	---	8.5	6.5	8.0	---	---	---
8	.5	.5	.5	---	---	---	9.0	5.5	8.5	---	---	---
9	.5	.5	.5	---	---	---	9.5	8.5	9.0	---	---	---
10	.5	.5	.5	3.0	1.5	2.5	9.5	6.5	9.5	---	---	---
11	.5	.5	.5	4.0	2.5	3.0	10.0	9.0	9.5	---	---	---
12	.5	.5	.5	3.5	3.5	3.5	10.0	9.0	9.5	19.5	17.5	18.5
13	.5	.5	.5	3.5	3.0	3.0	10.0	9.5	10.0	20.0	19.0	19.0
14	.5	.5	.5	3.0	3.0	3.0	---	---	---	---	---	---
15	.5	.5	.5	---	---	---	---	---	---	19.5	19.0	19.5
16	.5	.5	.5	3.5	2.5	3.0	12.5	11.5	12.0	20.0	19.0	19.5
17	1.0	.5	.5	3.0	3.0	3.0	13.0	12.0	12.5	20.5	19.5	20.0
18	1.0	.5	1.0	3.0	3.0	3.0	13.5	12.5	13.0	20.5	19.0	19.5
19	1.0	1.0	1.0	3.5	3.0	3.0	14.0	13.0	13.5	19.0	18.5	18.5
20	1.0	1.0	1.0	4.0	3.5	3.5	---	---	---	20.0	18.5	19.5
21	1.0	1.0	1.0	4.0	3.5	4.0	---	---	---	20.5	20.0	20.5
22	1.0	1.0	1.0	4.0	3.5	4.0	---	---	---	20.5	19.5	20.0
23	1.5	1.0	1.0	4.5	4.0	4.5	15.0	14.0	14.5	20.0	19.0	19.5
24	1.5	1.0	1.5	7.5	7.0	7.0	15.0	14.5	14.5	19.5	19.5	19.5
25	1.5	1.5	1.5	7.5	7.0	7.5	15.5	14.0	14.5	23.0	18.5	19.5
26	1.5	1.5	1.5	7.5	7.0	7.0	15 5	14.5	15.0	20.0	19.0	19.5
27	1.5	1.5	1.5	7.5	7.0	7.5	15.5	14.5	15.0	20.0	19.0	19.5
28	1.5	1.5	1.5	7.5	6.5	7.0	15.5	14.5	15.0	---	---	---
29	---	---	---	6.5	6.0	6.0	15.5	15.0	15.5	---	---	---
30	---	---	---	6.0	5.5	6.0	15.5	15.0	15.0	---	---	---
31	---	---	---	6.5	5.0	5.5	---	---	---	---	---	---
MONTH	1.5	.0	1.0	---	---	---	---	---	---	---	---	---

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		JUNE			JULY			AUGUST			SEPTEMBER	
1	---	---	---	24.5	24.0	24.0	29.0	27.5	28.0	22.0	20.0	20.5
2	---	---	---	24.5	24.0	24.0	28.5	27.5	28.0	21.0	20.0	20.5
3	---	---	---	24.5	24.0	24.0	28.0	27.5	28.0	22.0	20.0	20.0
4	21.0	20.0	20.5	24.5	24.0	24.5	27.5	27.0	27.0	20.5	20.0	20.0
5	21.5	20.5	21.0	24.5	24.0	24.0	27.0	26.5	26.5	21.0	20.5	20.5
6	---	---	---	25.0	24.0	24.5	28.0	26.5	26.5	21.5	20.5	21.0
7	22.0	20.5	21.5	25.0	24.5	24.5	---	---	---	21.5	21.0	21.0
8	22.0	21.5	21.5	25.0	24.5	24.5	---	---	---	21.5	21.0	21.0
9	22.5	21.5	22.0	25.5	24.5	25.0	---	---	---	21.0	20.5	20.5
10	21.5	21.0	21.5	26.0	25.0	25.5	---	---	---	20.5	20.5	20.5
11	22.0	21.0	21.5	25.5	24.5	25.0	---	---	---	20.5	20.0	20.5
12	22.5	21.5	22.0	25.0	24.0	24.5	26.5	25.0	25.5	20.5	20.0	20.0
13	23.5	21.5	22.5	24.5	24.0	24.0	25.0	25.0	25.0	20.5	20.0	20.0
14	23.5	22.5	23.0	24.5	23.5	24.0	28.0	24.5	25.0	20.5	20.0	20.0
15	23.5	22.5	23.0	24.5	24.0	24.0	26.5	24.5	25.0	21.0	18.5	19.5
16	---	---	---	---	---	---	25.5	25.0	25.5	19.0	19.0	19.0
17	25.0	24.5	24.5	25.0	24.0	24.5	25.5	25.0	25.0	19.0	18.5	19.0
18	26.0	24.5	25.0	25.0	24.5	25.0	25.0	24.5	25.0	19.0	18.5	18.5
19	25.5	25.0	25.0	25.5	24.5	25.0	25.0	24.5	24.5	19.5	18.0	18.0
20	---	---	---	25.5	25.0	25.5	25.0	23.0	23.5	18.0	17.5	18.0
21	---	---	---	---	---	---	23.5	23.0	23.0	18.0	17.5	17.5
22	25.5	25.0	25.0	---	---	---	23.0	22.5	23.0	17.5	16.0	17.0
23	27.0	25.0	26.0	---	---	---	22.5	22.0	22.5	20.0	16.5	16.5
24	26.5	26.5	26.5	27.0	26.5	26.5	22.5	22.0	22.0	17.0	16.5	17.0
25	26.5	26.0	26.5	26.5	26.5	26.5	22.5	22.0	22.0	17.0	16.5	17.0
26	26.0	25.0	25.5	26.5	26.5	26.5	22.0	21.5	22.0	17.0	16.5	17.0
27	25.0	25.0	25.0	---	---	---	21.5	21.5	21.5	17.5	16.5	17.0
28	26.0	25.0	25.5	27.0	26.5	26.5	22.0	21.5	21.5	17.5	17.0	17.5
29	25.5	25.5	25.5	---	---	---	22.0	21.5	22.0	17.5	16.5	17.0
30	25.5	23.0	24.5	28.0	27.5	28.0	22.0	21.5	22.0	17.0	16.5	16.5
31	---	---	---	29.0	27.5	28.5	21.5	21.5	21.5	---	---	---
MONTH	---	---	---	---	---	---	---	---	---	22.0	16.0	19.0

MISSISSIPPI RIVER MAIN STEM

05331578 MISSISSIPPI RIVER AT LOCK AND DAM 2 AT HASTINGS, MN

OXYGEN, DISSOLVED (DO), MG/L, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
	OCTOBER			NOVEMBER			DECEMBER			JANUARY		
1	7.9	[illegible].8	7.6	10.0	9.2	9.6	12.7	12.0	12.3	13.1	12.7	12.9
2	7.9	7.6	7.7	10.3	9.7	9.9	12.8	12.4	12.5	13.2	12.7	12.9
3	8.0	7.6	7.8	10.7	9.8	10.3	12.7	12.4	12.6	13.1	12.8	13.0
4	8.1	7.7	7.9	11.5	10.2	10.9	13.4	12.0	12.8	13.5	12.8	13.1
5	8.5	7.8	8.1	11.6	11.0	11.2	13.3	13.0	13.2	14.2	13.2	13.6
6	8.7	8.0	8.4	11.6	10.9	11.2	13.3	13.0	13.2	14.2	12.9	13.6
7	9.2	8.2	8.7	11.3	10.6	11.0	13.5	13.0	13.2	13.3	12.8	13.1
8	9.2	8.8	9.0	10.6	10.1	10.2	13.3	13.0	13.2	13.4	11.7	12.9
9	9.4	9.0	9.2	10.9	10.2	10.6	13.4	13.0	13.2	13.7	12.9	13.2
10	9.5	9.0	9.3	12.1	10.7	11.5	13.1	12.6	12.9	13.9	13.3	13.5
11	9.3	9.0	9.1	12.6	11.9	12.2	13.1	12.7	12.8	14.0	13.1	13.4
12	9.6	9.0	9.4	---	---	---	---	---	---	14.0	12.9	13.6
13	9.6	9.2	9.4	---	---	---	---	---	---	14.0	13.1	13.7
14	10.7	9.3	10.1	---	---	---	---	---	---	14.1	13.5	13.8
15	10.7	10.2	10.3	13.4	12.5	12.9	---	---	---	15.1	12.8	14.1
16	10.3	10.1	10.2	13.5	12.9	13.1	---	---	---	15.3	14.2	14.7
17	10.2	10.0	10.1	13.3	12.9	13.1	---	---	---	15.2	14.7	15.0
18	10.1	9.9	10.0	13.2	12.7	12.9	---	---	---	14.8	14.0	14.4
19	10.3	9.7	9.8	12.9	12.5	12.7	12.5	12.1	12.3	14.6	13.6	14.2
20	---	---	---	13.0	12.5	12.7	13.2	12.2	12.7	14.0	13.2	13.7
21	---	---	---	12.6	12.3	12.4	13.1	12.4	12.8	13.6	12.8	13.1
22	---	---	---	12.5	12.1	12.3	12.9	12.2	12.6	13.8	12.7	13.1
23	---	---	---	12.5	12.0	12.2	12.8	12.2	12.6	14.5	13.2	13.6
24	9.8	9.6	9.7	12.4	11.9	12.2	12.7	12.2	12.4	14.2	13.6	14.0
25	9.8	9.2	9.6	12.6	12.1	12.4	12.5	12.1	12.3	14.4	13.6	14.0
26	9.8	9.2	9.5	12.7	12.2	12.4	12.5	12.0	12.2	14.7	14.1	14.4
27	11.3	9.5	10.1	12.7	12.1	12.4	12.7	12.2	12.5	14.9	13.9	14.6
28	11.0	9.9	10.4	12.5	12.1	12.3	12.9	12.5	12.7	14.7	13.8	14.2
29	10.3	9.7	9.9	12.8	12.2	12.5	13.2	12.6	12.9	14.5	13.3	13.8
30	10.3	9.5	9.9	12.6	12.3	12.4	13.1	12.9	13.0	13.3	12.4	12.9
31	9.8	9.2	9.4	---	---	---	13.1	12.7	12.9	12.4	11.9	12.1
MONTH	---	---	---	---	---	---	---	---	---	15.3	11.7	13.6

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
	FEBRUARY			MARCH			APRIL			MAY		
1	11.9	11.6	11.7	13.1	11.9	12.3	12.5	11.6	11.9	9.5	7.6	8.4
2	13.9	11.5	11.7	12.5	11.6	12.0	---	---	---	8.9	6.6	7.5
3	13.4	11.9	12.4	14.6	11.6	13.1	13.4	12.1	12.8	9.5	7.1	8.3
4	13.8	12.9	13.2	14.5	13.2	13.7	14.0	12.5	13.1	10.9	8.5	9.2
5	14.0	13.0	13.7	---	---	---	14.4	12.8	13.4	---	---	---
6	14.1	13.2	13.5	---	---	---	14.9	12.5	13.6	---	---	---
7	14.5	13.7	13.9	---	---	---	15.7	12.9	14.1	---	---	---
8	14.4	13.5	13.9	---	---	---	15.0	13.1	13.7	---	---	---
9	14.2	13.5	13.8	---	---	---	16.0	13.4	14.7	---	---	---
10	14.2	13.4	13.9	---	---	---	13.9	11.7	12.9	---	---	---
11	14.4	13.3	13.8	14.3	13.0	13.5	13.5	10.2	11.6	---	---	---
12	14.5	13.9	14.2	15.0	13.6	14.0	12.7	9.2	10.8	11.2	7.8	9.2
13	14.6	13.8	14.2	14.8	13.5	14.2	11.7	10.1	10.7	9.1	8.8	9.0
14	14.6	14.1	14.3	14.4	12.9	13.7	---	---	---	---	---	---
15	15.1	14.1	14.5	13.9	12.6	13.3	---	---	---	8.1	5.9	7.0
16	15.5	14.3	14.9	13.9	13.1	13.5	---	---	---	7.7	5.8	6.7
17	16.5	14.2	15.4	13.7	13.0	13.4	13.4	10.5	12.1	8.3	5.2	6.9
18	16.8	14.1	16.2	13.6	12.6	12.9	13.0	10.8	11.7	---	---	---
19	16.7	15.8	16.3	13.5	12.3	12.9	12.5	8.0	9.7	---	---	---
20	16.5	15.7	16.1	14.6	13.0	13.6	---	---	---	7.3	5.7	6.5
21	16.6	15.7	16.2	13.7	12.1	12.6	---	---	---	7.1	5.4	6.2
22	16.5	15.5	15.9	13.6	11.3	12.5	---	---	---	6.4	5.4	6.0
23	16.3	14.8	15.3	13.0	11.3	12.0	13.0	8.7	10.7	8.8	5.5	6.6
24	15.6	14.2	14.9	---	---	---	11.4	9.4	10.0	9.2	6.7	7.9
25	15.4	13.8	14.6	15.0	13.2	14.1	11.1	8.0	9.3	9.1	7.2	8.0
26	14.9	13.2	14.0	14.2	12.1	13.0	12.9	9.4	11.0	9.1	7.1	8.1
27	14.5	13.9	14.3	14.0	11.8	13.1	12.1	8.8	10.1	---	---	---
28	14.0	13.0	13.4	13.9	12.2	13.0	---	---	---	---	---	---
29	---	---	---	12.9	11.6	12.2	12.3	10.3	11.4	---	---	---
30	---	---	---	13.1	11.7	12.3	12.8	9.1	10.3	---	---	---
31	---	---	---	12.8	12.3	12.5	---	---	---	---	---	---
MONTH	16.8	11.5	14.3	---	---	---	---	---	---	---	---	---

05331578 MISSISSIPPI RIVER AT LOCK AND DAM 2 AT HASTINGS, MN

OXYGEN, DISSOLVED (DO), MG/L, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		JUNE			JULY			AUGUST			SEPTEMBER	
1	---	---	---	9.3	5.4	7.5	8.2	5.7	7.0	8.7	6.8	7.7
2	---	---	---	8.3	6.7	7.4	7.9	5.0	6.0	9.7	7.0	7.8
3	---	---	---	7.7	6.2	6.8	7.2	4.7	5.6	9.1	6.6	8.2
4	9.5	7.3	8.3	7.4	5.6	6.5	5.5	4.4	4.9	8.7	7.6	8.1
5	9.5	7.6	8.2	6.8	5.6	6.1	5.7	4.0	5.2	8.4	7.0	7.7
6	---	---	---	7.8	4.4	5.8	7.2	4.9	5.5	9.7	6.7	7.8
7	9.8	7.4	8.6	7.7	5.5	6.2	---	---	---	8.9	6.0	7.2
8	9.8	7.4	8.5	8.0	5.2	6.7	---	---	---	8.5	6.7	7.5
9	---	---	---	7.9	5.0	6.7	---	---	---	8.4	6.9	7.7
10	7.8	7.5	7.7	---	---	---	---	---	---	7.4	6.4	6.9
11	8.6	6.7	7.4	8.0	5.3	6.1	---	---	---	8.5	6.5	7.4
12	8.9	7.1	7.9	---	---	---	6.8	5.7	6.0	8.0	6.8	7.4
13	9.8	6.7	8.1	6.8	4.8	5.7	6.9	4.8	5.5	8.6	6.7	7.8
14	9.1	6.5	7.7	6.2	4.8	5.3	6.0	4.5	5.0	8.4	5.6	7.1
15	8.7	6.7	7.7	7.7	5.6	6.5	---	---	---	8.8	6.3	7.2
16	---	---	---	---	---	---	6.5	4.2	5.2	8.2	6.9	7.2
17	6.5	5.5	6.0	7.2	5.6	6.4	7.2	5.0	6.0	7.9	6.6	7.2
18	7.0	4.6	5.5	6.5	5.3	5.8	7.4	5.3	6.2	8.5	6.6	7.4
19	7.6	4.3	5.7	7.9	4.9	6.0	8.2	4.2	6.7	8.5	7.0	8.0
20	---	---	---	7.1	5.3	5.9	7.7	5.7	6.6	9.6	8.2	8.9
21	---	---	---	---	---	---	7.1	5.6	6.1	9.7	7.8	8.7
22	7.3	4.6	5.5	---	---	---	7.2	5.4	6.1	9.8	7.8	8.7
23	7.8	5.5	6.2	---	---	---	7.8	5.4	6.5	9.5	7.6	8.5
24	7.0	4.9	5.9	6.2	5.2	5.7	8.6	5.7	6.8	8.4	7.7	8.0
25	7.7	5.2	6.6	---	---	---	7.5	6.4	6.9	10.2	7.4	8.9
26	8.3	6.2	7.2	---	---	---	6.9	5.6	6.1	9.5	8.2	8.8
27	8.5	6.6	7.4	---	---	---	6.3	5.2	5.7	8.8	7.5	8.1
28	8.4	6.4	7.0	7.7	5.0	6.3	7.5	5.2	6.0	8.9	7.6	8.3
29	8.4	6.4	7.4	---	---	---	7.1	5.7	6.4	9.3	7.6	8.5
30	---	---	---	---	---	---	7.9	6.2	7.1	9.5	7.5	8.5
31	---	---	---	---	---	---	8.8	6.5	7.5	---	---	---
MONTH	---	---	---	---	---	---	---	---	---	10.2	5.6	7.9

05336700 KETTLE RIVER BELOW SANDSTONE, MN

LOCATION.--Lat 46°06'20", long 92°51'50", in NW¼SW¼ sec.22, T.42 N., R.20 W., Pine County, Hydrologic Unit 07030003, on Sandstone Federal Correctional Institution property, on left bank about 900 ft downstream from abandoned powerplant dam, 1.8 mi south of Sandstone.

DRAINAGE AREA.--863 mi^2.

PERIOD OF RECORD.--October 1967 to current year.

GAGE.--Water-stage recorder and crest-stage gage. Datum of gage is 931.50 ft above National Geodetic Vertical Datum of 1929. (Minnesota Department of Transportation bench mark).

REMARKS.--Records good except those for Nov. 11-18, Dec. 5-8, 10-15, Jan. 15-17, Jan. 22 to Feb. 1, which are fair.

AVERAGE DISCHARGE.--20 years, 746 ft^3/s, 11.74 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 17,200 ft^3/s, July 23, 1972, gage height, 15.38 ft; minimum, 25 ft^3/s, Nov. 11, 12, 1977, gage height, 3.37 ft, result of freezeup.

EXTREMES OUTSIDE PERIOD OF RECORD.--Flood in April 1965 reached a stage of 12.96 ft, from flood marks, discharge, 13,400 ft^3/s.

EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 3,600 ft^3/s and maximum (*)

Date	Time	Discharge (ft^3/s)	Gage height (ft)	Date	Time	Discharge (ft^3/s)	Gage height (ft)
Oct. 1	0030	*2,360	*6.72	No peaks greater than base discharge			
(occurred on recession following peak of Sept. 23, 1986)							
May 23	1700	1,640	6.15				
(maximum independent peak)							

Minimum discharge, 115 ft^3/s, Sept. 30; gage height, 4.00 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	2230	559	437	263	e230	181	614	329	633	122	254	148
2	1910	544	422	259	228	182	539	329	631	125	239	141
3	1660	530	415	256	220	188	493	329	627	131	227	135
4	1460	515	338	254	217	187	458	314	544	128	216	133
5	1300	503	e340	254	214	192	427	293	473	128	213	130
6	1150	502	e340	254	210	220	421	282	415	131	203	131
7	1050	525	e340	254	210	339	416	272	365	135	187	148
8	1000	776	e340	232	212	626	416	263	322	161	173	164
9	987	1420	347	244	206	604	422	251	289	173	161	127
10	943	1200	e345	263	206	515	442	250	272	151	150	118
11	908	e900	e340	249	210	580	469	241	275	126	141	120
12	944	e750	e340	238	210	478	478	232	292	140	157	125
13	1010	e650	e340	238	210	402	478	229	294	142	182	126
14	1020	e600	e340	238	214	366	478	226	277	139	212	128
15	1020	e560	e340	e210	199	323	478	226	250	132	216	126
16	1020	e520	339	e214	212	305	486	217	241	125	232	127
17	991	e500	325	e220	211	302	496	204	229	120	234	143
18	940	e470	316	226	202	296	496	212	210	128	236	146
19	889	443	303	224	190	296	496	350	196	284	232	150
20	839	436	300	222	184	311	493	522	177	418	218	167
21	794	447	288	222	184	351	483	551	166	483	201	184
22	754	450	281	e220	184	413	471	890	160	494	188	183
23	718	449	278	e220	181	495	447	1540	157	437	175	174
24	689	433	273	e223	181	732	424	1560	149	400	163	165
25	675	440	272	e225	181	1030	413	1340	141	359	158	151
26	654	438	272	e230	177	1130	399	1200	137	315	162	139
27	641	438	269	e233	177	1140	389	1120	126	275	164	134
28	632	438	268	e236	180	1080	371	1010	125	270	163	130
29	611	438	268	e235	---	946	354	899	125	274	155	123
30	586	438	266	e234	---	806	337	795	125	274	159	116
31	570	---	263	e232	---	692	---	702	---	268	151	---
TOTAL	30595	17312	9945	7322	5640	15708	13584	17178	8423	6988	5922	4232
MEAN	987	577	321	236	201	507	453	554	281	225	191	141
MAX	2230	1420	437	263	230	1140	614	1560	633	494	254	184
MIN	570	433	263	210	177	181	337	204	125	120	141	116
AC-FT	60690	34340	19730	14520	11190	31160	26940	34070	16710	13860	11750	8390
CFSM	1.14	.67	.37	.27	.23	.59	.52	.64	.33	.26	.22	.16
IN.	1.32	.75	.43	.32	.24	.68	.59	.74	.36	.30	.26	.18

CAL YR 1986 TOTAL 490544 MEAN 1344 MAX 9230 MIN 180 AC-FT 973000 CFSM 1.56 IN. 21.15
WTR YR 1987 TOTAL 142849 MEAN 391 MAX 2230 MIN 116 AC-FT 283300 CFSM .45 IN. 6.16

e Estimated

ST. CROIX RIVER BASIN

05337400 KNIFE RIVER NEAR MORA, MN

LOCATION.--Lat 45°55'12", long 93°18'26", in SW¼SW¼S sec.26, T.40 N., R.24 W., Kanabec County, Hydrologic Unit 07030004, on left bank 400 ft upstream from bridge on County Highway 77, 1.1 mi upstream from mouth and 2.5 mi north of Mora.

DRAINAGE AREA.--102 mi^2.

PERIOD OF RECORD.--Occasional low-flow measurements, water years 1969-74; July 1974 to current year.

GAGE.--Water-stage recorder. Datum of gage is 991.20 ft above National Geodetic Vertical Datum of 1929. (Kanabec County bench mark).

REMARKS.--Records good except those for periods of estimated daily record, which are fair.

AVERAGE DISCHARGE.--13 years, 67.2 ft^3/s, 8.95 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 1,840 ft^3/s, May 10, 1979, gage height, 6.31 ft; maximum gage height, 6.69 ft, Nov. 24, 1977, from floodmark (backwater from ice); minimum daily discharge, 1.1 ft^3/s, Jan. 12 to Feb. 9, 1977.

EXTREMES OUTSIDE PERIOD OF RECORD.--Flood of July 26, 1972, reached a stage of 14.0 ft, from information by local resident (discharge not determined). Result of dam failure and backwater from collapsed bridge.

EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 500 ft^3/s and maximum (*):

Date	Time	Discharge (ft^3/s)	Gage height (ft)	Date	Time	Discharge (ft^3/s)	Gage height (ft)
Oct. 1	0015	*148	3.09	Dec. 20	0900	Ice jam	*3.30
(occurred on recession following peak of Sept. 22, 1986)				No peak greater than base discharge.			
Nov. 11	0815	138	3.04				
(maximum independent peak)							

Minimum discharge, 1.4 ft^3/s, Sept. 15, gage height, 1.39 ft, minimum gage height, 1.39 ft, Aug. 10, 11, 12, Sept. 15.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	137	45	31	e18	e15	15	68	19	40	1.9	3.3	1.7
2	117	41	31	e18	e16	16	55	22	33	2.5	2.6	1.7
3	112	44	31	e18	e16	16	46	20	29	1.9	3.6	2.3
4	94	41	e31	e18	e16	17	43	16	21	1.9	3.9	1.8
5	88	41	e30	e17	e17	18	45	15	19	1.8	2.9	1.7
6	74	45	e29	e17	e17	21	42	16	14	1.8	2.0	1.7
7	72	49	28	e17	17	26	37	14	14	2.2	1.7	1.6
8	74	45	27	e17	e18	38	35	12	16	2.4	1.7	1.5
9	63	77	e27	e17	e19	43	32	10	15	3.0	1.6	1.5
10	57	86	e26	e17	16	45	35	11	12	2.4	1.5	1.7
11	65	96	e26	e17	16	45	36	13	20	4.3	1.5	1.8
12	59	74	e25	e17	15	44	34	10	18	7.7	12	1.6
13	63	78	e25	e17	15	42	36	7.9	16	6.8	18	1.5
14	66	59	e25	e17	15	41	43	10	16	4.3	15	1.5
15	65	55	e24	e17	e15	38	33	8.1	13	3.2	14	1.5
16	69	51	e24	e16	14	39	30	6.3	11	2.4	25	1.6
17	68	46	e24	e16	13	36	29	11	9.6	1.9	20	3.1
18	69	42	23	e16	13	34	31	16	10	1.7	21	4.1
19	68	41	e23	e16	13	34	31	13	9.1	2.2	35	3.6
20	68	40	e23	e15	12	34	36	13	7.6	4.7	76	3.0
21	65	37	e23	e15	13	34	40	16	7.2	11	72	2.9
22	62	37	22	e15	13	35	31	30	6.1	9.6	71	2.9
23	61	35	21	e15	14	42	31	38	5.0	8.4	70	3.0
24	59	34	e20	e15	14	55	25	47	4.7	12	49	2.6
25	56	34	e20	e15	14	65	25	56	4.1	10	3.6	2.4
26	55	32	e20	e15	14	73	27	63	3.3	9.1	2.4	2.5
27	53	31	e19	e15	14	76	30	65	2.8	7.6	2.1	2.4
28	54	31	e19	e15	15	80	23	62	2.2	5.7	2.0	1.7
29	52	31	e19	e15	---	72	27	61	2.0	5.3	1.7	1.7
30	48	32	e18	e15	---	71	21	56	1.9	5.0	1.7	1.8
31	44	---	e18	e15	---	64	---	48	---	4.3	1.7	---
TOTAL	2167	1430	752	503	419	1309	1057	805.3	382.6	149.0	539.5	64.4
MEAN	69.9	47.7	24.3	16.2	15.0	42.2	35.2	26.0	12.8	4.81	17.4	2.15
MAX	137	96	31	18	19	80	68	65	40	12	76	4.1
MIN	44	31	18	15	12	15	21	6.3	1.9	1.7	1.5	1.5
AC-FT	4300	2840	1490	998	831	2600	2100	1600	759	296	1070	128
CFSM	.69	.47	.24	.16	.15	.41	.35	.25	.13	.05	.17	.02
IN.	.79	.52	.27	.18	.15	.48	.39	.29	.14	.05	.20	.02

CAL YR 1986 TOTAL 47661 MEAN 131 MAX 1610 MIN 14 AC-FT 94540 CFSM 1.28 IN. 17.38
WTR YR 1987 TOTAL 9577.8 MEAN 26.2 MAX 137 MIN 1.5 AC-FT 19000 CFSM .26 IN. 3.49

e Estimated

05340500 ST. CROIX RIVER AT ST. CROIX FALLS, WI

LOCATION.--Lat 45°24'25", long 92°38'49", in SW¼NW¼ sec.30, T.34 N., R.18 W., Polk County, Hydrologic Unit 07030005, St. Croix National Scenic Riverway, on left bank, 1,500 ft downstream from powerplant of Northern States Power Co., in St. Croix Falls, and at mile 52.2.

DRAINAGE AREA.--6,240 mi^2.

PERIOD OF RECORD.--January 1902 to current year. Prior to January 1910, monthly discharge only, published in WSP 1308. Prior to October 1939, published as "near St. Croix Falls."

REVISED RECORDS.--WSP 1115: 1929. WDR WI-82-1: Drainage area.

GAGE.--Water-stage recorder and crest-stage gage. Datum of gage is 689.94 ft above National Geodetic Vertical Datum of 1929. Prior to July 1905, gage heights and discharge measurements were used by Loweth and Wolff, consulting engineers of St. Paul, Minn., to determine the flow. July 1905 to February 1940, records were computed from power generation at the St. Croix Falls Powerplant. February 1940 to Sept. 30, 1979, water-stage recorder at site 300 ft downstream at same datum.

REMARKS.--Estimated daily discharges: Aug. 1-31. Powerplant data provided by Northern States Power Company was used for Aug. 1-31. Records are good. Diurnal fluctuation caused by St. Croix Falls Powerplant 1,500 ft upstream. Data-collection platform at station.

AVERAGE DISCHARGE.--85 years, 4,346 ft^3/s, 9.44 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 54,900 ft^3/s, May 8, 1950, gage height, 25.19 ft; minimum daily, 75 ft^3/s, July 17, 1910.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 15,300 ft^3/s, Oct. 1, gage height, 7.84 ft; occurred on recession following peak of Sept. 26, 1986; maximum independent peak discharge, 9,530 ft^3/s, Oct. 21, gage height, 5.55 ft; minimum daily, 1,510 ft^3/s July 5.

RATING TABLE (gage height, in feet, and discharge, in cubic feet per second)

2.5	1,400	6.0	10,700
3.0	2,350	8.0	15,700
4.0	4,950		

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	14400	5320	4660	3640	3000	2870	4720	3200	3570	1680	2120	1920
2	12800	5040	4480	3520	2700	3100	4690	3090	3690	1600	2280	1780
3	11300	5030	4410	3530	2970	3270	4260	2980	3500	1730	2310	1660
4	10200	4980	4080	3460	2880	3080	4120	2940	4160	1610	2450	1670
5	9350	4990	3210	3370	3120	3540	3780	2820	4070	1510	2610	1670
6	8530	5350	3220	3760	3050	3550	3610	2980	3710	1690	1990	1700
7	8210	5400	3320	3080	2880	4080	3490	2600	3320	1720	2210	1710
8	9070	5290	3450	3630	2960	4560	3480	2330	3130	1580	1910	1760
9	6150	5800	3510	3630	2850	4590	3590	2550	2960	1650	1770	1780
10	5310	6150	3230	3430	2910	4450	3620	2540	2520	1730	1830	1780
11	6420	5500	2800	2900	2960	4800	3800	2880	2930	1810	1720	1860
12	6500	3540	2610	3440	3060	4870	3640	2210	2890	1820	1720	1760
13	7140	3630	2190	3440	2810	4680	3770	2330	2640	1820	1850	1760
14	7690	3550	2780	3390	2930	4250	3640	2480	2920	1800	2260	1790
15	7980	3550	3270	3620	3000	4150	3660	2540	2510	1790	2200	1870
16	7960	4210	3630	3010	2960	4160	3830	1940	2520	1680	1970	2050
17	7570	4530	3640	2320	2860	3660	3740	2420	2110	1690	2500	2010
18	7430	4850	3620	2770	2630	3690	3780	2440	2660	1660	2380	2790
19	7040	4820	3810	3170	3190	3490	3660	2590	2630	1680	2240	2890
20	6920	4460	3500	2550	2750	3940	3690	3040	1820	1860	1970	2970
21	6820	4430	3510	2980	3190	4020	3760	3920	1800	2620	2310	3090
22	6510	4410	3610	2760	2250	3980	3610	3740	1920	2540	1960	2430
23	6470	4950	3390	2910	3010	4180	3440	3950	1960	2800	2260	2910
24	6320	4690	3520	2710	3050	4670	3440	5060	1920	2820	2230	2450
25	5420	5010	3690	2580	3150	5300	3380	5480	1740	2910	1890	2440
26	5670	5100	3540	2850	3000	5390	3180	4710	1730	2340	1750	2500
27	5700	4900	3380	2480	3010	6310	3440	4390	1730	2500	1920	2030
28	5080	4770	3560	2480	3060	6230	3340	4390	1620	2470	1990	2230
29	5990	4630	3590	2610	---	6180	2940	4520	1620	2320	1940	2310
30	4880	4640	3590	2680	---	5230	2990	3990	1630	3360	1980	1990
31	5760	---	3380	2750	---	5090	---	3950	---	2520	2030	---
TOTAL	232590	143520	108180	95450	82190	135370	110090	101000	77930	63310	64550	63560
MEAN	7503	4784	3490	3079	2935	4367	3670	3258	2598	2042	2082	2119
MAX	14400	6150	4660	3760	3190	6310	4720	5480	4160	3360	2610	3090
MIN	4880	3540	2190	2320	2250	2870	2940	1940	1620	1510	1720	1660
AC-FT	461300	284700	214600	189300	163000	268500	218400	200300	154600	125600	128000	126100
CFSM	1.20	.77	.56	.49	.47	.70	.59	.52	.42	.33	.33	.34
IN.	1.39	.86	.64	.57	.49	.81	.66	.60	.46	.38	.38	.38

CAL YR 1986 TOTAL 3063510 MEAN 8393 MAX 36700 MIN 1460 AC-FT 6076000 CFSM 1.35 IN. 18.26
WTR YR 1987 TOTAL 1277740 MEAN 3501 MAX 14400 MIN 1510 AC-FT 2534000 CFSM .56 IN. 7.62

MISSISSIPPI RIVER MAIN STEM

05344500 MISSISSIPPI RIVER AT PRESCOTT, WI

LOCATION.--Lat 44°44'45", long 92°48'00", in sec.9, T.26 N., R.20 W., Pierce County, Hydrologic Unit 07040001, on left bank at Prescott, 200 ft downstream from St. Croix River, 300 ft south of Chicago, Burlington & Quincy Railroad bridge, 800 ft south of bridge on U.S. Highway 10, and at mile 811.4 upstream from Ohio River.

DRAINAGE AREA.--44,800 mi^2, approximately.

PERIOD OF RECORD.--June 1928 to current year.

REVISED RECORDS.--WSP 1508: 1941. WRD MN-74: 1973.

GAGE.--Water-stage recorder. Datum of gage is 649.50 ft above National Geodetic Vertical Datum of 1929. Prior to Aug. 2, 1932, nonrecording gage at railroad bridge 300 ft upstream at following datums: June 3, 1928, to Sept. 30, 1929, 19.27 ft higher; Oct. 1, 1929, to Sept. 30, 1930, 17.68 ft higher; Oct. 1, 1930, to Aug. 1, 1932, 19.28 ft higher. Aug. 2, 1932, to Oct. 30, 1938, water-stage recorder at present site at datum 19.28 ft higher; Nov. 1, 1938, to Sept. 7, 1971, water-stage recorder at present site at datum 50.00 ft lower. Auxiliary water-stage recorder 10.7 mi downstream from base gage.

REMARKS.--Records good except those for July 27, 28, which are fair. Some regulation by reservoirs, navigation dams, and powerplants at low and medium stages. Flood flow not materially affected by artificial storage.

AVERAGE DISCHARGE.--59 years, 17,390 ft^3/s, 5.27 in/yr; median of yearly mean discharges, 17,000 ft^3/s, 5.15 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum daily discharge, 228,000 ft^3/s, Apr. 18, 1965, gage height, 43.11 ft; minimum daily, 1,380 ft^3/s, July 13, 1940; minimum gage height, 15.08 ft, Aug. 29, 1934, present datum.

EXTREMES FOR CURRENT YEAR.--Maximum daily discharge, 83,400 ft^3/s, Oct. 1, stage falling, peak occurred Sept. 29, 1986; maximum recorded gage height, 34.42 ft, Oct. 1; maximum independent daily discharge, 29,400 ft^3/s, Mar. 30, 31; minimum daily, 6,140 ft^3/s, Sept. 15; minimum gage height, 24.59 ft, May 9.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	83400	32200	23300	17600	12500	13400	29000	14600	23800	9950	13200	7890
2	80800	30600	23500	17600	12900	13400	28900	14200	24000	9520	12500	7440
3	78000	29800	23100	17000	12900	13900	28100	14100	24000	8920	13000	7380
4	74600	29200	23400	17300	13800	14000	27500	14200	23700	8500	13000	7170
5	71000	29400	23000	17000	12700	13700	26100	14200	23300	8370	12900	7480
6	67400	28700	20700	16400	13400	14400	25100	13800	23100	7910	12400	6410
7	63300	28900	19600	17100	13200	14500	23600	13300	21200	7990	11600	6480
8	60100	28800	19800	16300	13400	15800	23400	12700	20800	7610	11000	7010
9	58400	29200	19400	16700	12700	16600	22400	12300	18500	7310	10500	6670
10	53100	28700	20200	16100	12400	17700	22100	12000	17500	7370	10100	6670
11	49900	28600	19000	16000	12300	18200	22000	11700	16500	7390	10400	6720
12	49500	27300	17100	15000	12700	18200	21600	11500	16000	7510	9790	6930
13	47200	23700	16200	16600	12900	18400	21000	10800	15200	7490	9220	6450
14	45900	21600	13500	16500	12500	18500	20800	11000	14200	7740	9210	6540
15	45400	20100	18200	16200	12800	18000	20600	10100	14100	7520	9780	6140
16	45000	21500	19800	15400	13100	17600	20500	9960	13200	7800	9850	6320
17	45200	21300	20200	13400	12200	17400	20300	9350	12400	7810	9220	6500
18	44000	23500	20100	12100	12900	16500	20100	9760	11400	9310	11000	6420
19	43700	24200	19500	13600	12900	16100	20300	9700	11900	10200	10300	7510
20	42700	23800	20000	14300	13300	15900	19600	9370	11500	9500	9550	7420
21	42300	22500	18900	13200	12500	16500	19500	10600	10200	10100	8980	7820
22	40700	23100	18600	13600	13100	16300	19300	11400	10100	10700	9520	8570
23	38600	22300	18800	13300	12100	16200	19000	11600	9810	10600	9490	8220
24	37700	24400	18600	10700	13100	16700	18000	13000	9450	18700	8970	8850
25	36400	23900	18600	10500	13000	18400	17600	15500	10300	19100	8920	8760
26	34600	24100	19000	11300	13100	20100	17000	18600	10600	17600	8200	8050
27	33600	23700	18200	11800	13100	21400	16200	19100	10000	e15600	7950	8500
28	33400	23700	17900	12200	13200	25800	16500	20800	10400	e14500	8470	8240
29	32400	23300	17900	13500	---	28400	15900	22400	10300	13400	8350	7680
30	32500	23100	18400	12900	---	29400	15100	23400	9920	12800	8030	7930
31	31100	---	17900	13100	---	29400	---	23300	---	14100	7820	---
TOTAL	1541900	765200	602400	454300	360700	560800	637100	428340	457380	322920	313220	220170
MEAN	49740	25510	19430	14650	12880	18090	21240	13820	15250	10420	10100	7339
MAX	83400	32200	23500	17600	13800	29400	29000	23400	24000	19100	13200	8850
MIN	31100	20100	13500	10500	12100	13400	15100	9350	9450	7310	7820	6140
AC-FT	3058000	1518000	1195000	901100	715400	1112000	1264000	849600	907200	640500	621300	436700
CFSM	1.11	.57	.43	.33	.29	.40	.47	.31	.34	.23	.23	.16
IN.	1.28	.64	.50	.38	.30	.47	.53	.36	.38	.27	.26	.18

CAL YR 1986 TOTAL 14632100 MEAN 40090 MAX 116000 MIN 10600 AC-FT 29020000 CFSM .89 IN. 12.15
WTR YR 1987 TOTAL 6664430 MEAN 18260 MAX 83400 MIN 6140 AC-FT 13220000 CFSM .41 IN. 5.53

e Estimated

05345000 VERMILLION RIVER NEAR EMPIRE, MN

LOCATION.--Lat 44°40'00", long 93°03'17", in SW¼NW¼ sec.24, T.114 N., R.19 W., Dakota County, Hydrologic Unit 07040001, on right bank and just downstream from County Road 79, 2 mi west of Empire and 4 mi northeast of Farmington.

DRAINAGE AREA.--110 mi^2.

WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--May 1942 to June 1945 (no record during July, August, and September 1944), September 1969 to September 1973 (discharge measurements only), October 1973 to current year. Prior to October 1975 published as "near Empire City".

GAGE.--Water-stage recorder. Datum of gage is 851.99 ft above National Geodetic Vertical Datum of 1929 (levels by U.S. Army Corps of Engineers). April 12, 1942, to June 30, 1944, and October 1, 1944, to July 7, 1945, nonrecording gage at same site and present datum.

REMARKS.--Records good. Some regulation at low flow by sewage plant upstream.

AVERAGE DISCHARGE.--15 years (water years 1943, 1974-87), 56.8 ft^3/s, 7.01 in/yr, 41,150 acre-ft/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 2,030 ft^3/s, Sept. 18, 1942; maximum gage height, 8.30 ft, Sept. 22, 1986; minimum daily discharge, 8.4 ft^3/s, Jan. 15, 1975; minimum gage height, 1.63 ft, Oct. 14, 1976.

EXTREMES OUTSIDE PERIOD OF RECORD.--Flood in April 1965, reached a stage of 7.5 ft, from information by local resident, discharge 6,200 ft^3/s, from rating extended above 2,100 ft^3/s.

EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 200 ft^3/s and maximum (*):

Date	Time	Discharge (ft^3/s)	Gage height (ft)	Date	Time	Discharge (ft^3/s)	Gage height (ft)
Oct. 13	1300	237	5.47	Aug. 10	0030	216	5.16
July 25	1400	*358	*6.26				

Minimum discharge, 21 ft^3/s, July 3, 4; minimum gage height, 2.01 ft, July 3.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	179	99	64	55	40	45	56	40	36	24	57	38
2	162	94	65	54	41	44	52	61	34	24	51	38
3	160	92	66	53	41	43	51	52	32	22	49	38
4	157	88	62	52	41	43	50	47	31	22	47	37
5	150	86	59	53	40	46	50	43	31	24	44	35
6	140	83	60	53	41	50	50	41	30	33	42	35
7	130	81	60	53	42	63	50	40	29	27	40	34
8	126	88	60	52	44	70	50	38	28	26	40	34
9	117	83	60	53	44	63	50	39	28	32	149	33
10	112	76	55	52	43	54	50	38	29	28	199	33
11	122	68	e54	52	43	54	49	39	31	26	108	33
12	204	67	e53	51	43	51	49	37	29	26	76	33
13	235	60	54	51	43	49	48	37	27	26	69	32
14	211	62	55	50	44	54	48	42	26	25	65	32
15	173	61	55	49	42	53	49	39	25	25	62	32
16	150	61	56	46	42	51	49	37	25	25	70	33
17	137	61	57	46	42	49	48	35	26	24	65	34
18	128	61	58	46	41	49	47	35	27	23	57	33
19	121	59	58	45	41	50	46	38	26	30	53	33
20	118	60	58	45	40	52	45	41	25	26	49	34
21	116	59	55	44	40	54	43	44	25	48	48	35
22	112	60	56	44	41	54	44	41	25	56	46	33
23	113	60	56	e42	42	59	44	39	24	43	43	32
24	112	60	56	e40	41	65	43	39	24	298	42	31
25	112	61	56	e39	41	73	43	39	25	345	41	30
26	109	63	56	38	42	78	42	41	24	242	42	29
27	105	64	56	38	42	74	42	39	23	129	41	30
28	100	64	55	38	43	68	40	37	24	87	46	29
29	96	65	56	38	---	63	39	37	27	74	44	29
30	92	64	55	38	---	59	37	37	25	68	41	28
31	96	---	56	38	---	56	---	35	---	64	39	---
TOTAL	4195	2110	1782	1448	1170	1736	1404	1247	821	1972	1865	990
MEAN	135	70.3	57.5	46.7	41.8	56.0	46.8	40.2	27.4	63.6	60.2	33.0
MAX	235	99	66	55	44	78	56	61	36	345	199	38
MIN	92	59	53	38	40	43	37	35	23	22	39	28
AC-FT	8320	4190	3530	2870	2320	3440	2780	2470	1630	3910	3700	1960
CFSM	1.23	.64	.52	.42	.38	.51	.43	37	.25	.58	.55	.30
IN.	1.42	.71	.60	.49	.40	.59	.47	.42	.28	.67	.63	.33

CAL YR 1986 TOTAL 43188 MEAN 118 MAX 1230 MIN 31 AC-FT 85660 CFSM 1.08 IN. 14.61
WTR YR 1987 TOTAL 20740 MEAN 56.8 MAX 345 MIN 22 AC-FT 41140 CFSM .52 IN. 7.01

e Estimated

05345000 VERMILLION RIVER NEAR EMPIRE, MN--Continued

WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1973 to current year.

PERIOD OF DAILY RECORD.--
SPECIFIC CONDUCTANCE: February 1974 to current year.
pH: February 1974 to current year.
WATER TEMPERATURES: February 1974 to current year.
DISSOLVED OXYGEN: February 1974 to current year.

INSTRUMENTATION.--Water quality monitor since February 1974.

REMARKS.--Water is pumped to a monitor that is inside a heated shelter; water temperature during the winter may be affected. Extremes are for those years with 80 percent or more record.

COOPERATION.--Water-quality monitor is operated by the Metropolitan Waste Control Commission, St. Paul, MN.

EXTREMES FOR PERIOD OF DAILY RECORD.--
SPECIFIC CONDUCTANCE (water years 1979-82, 1984-87): Maximum, 997 microsiemens Jan. 7, 1982; minimum, 236 microsiemens June 8, 1980.
pH (water years 1979-82, 1986): Maximum, 9.3 units Nov. 11, 1978; minimum, 6.7 units Mar. 20, 1980.
WATER TEMPERATURES (water years 1979-82, 1984-87): Maximum, 30.0°C July 13, 1984; minimum 0.0°C many days during winter period.
DISSOLVED OXYGEN (water years 1979-82, 1984-85, 1987): Maximum, 16.0 mg/L Apr. 18, 1985; minimum, 1.5 mg/L Nov. 14, 1979.

EXTREMES FOR CURRENT YEAR.--
SPECIFIC CONDUCTANCE: Maximum, 976 microsiemens July 2; minimum, 406 microsiemens Nov. 7.
WATER TEMPERATURES: Maximum, 28.5°C July 17; minimum, 0.0°C several days during winter period.
DISSOLVED OXYGEN: Maximum, 15.5 mg/L Jan. 22; minimum, 4.5 mg/L Aug. 6.

SPECIFIC CONDUCTANCE (MICROSIEMENS/CM AT 25 DEG. C), WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		OCTOBER			NOVEMBER			DECEMBER			JANUARY	
1	576	552	566	643	610	626	721	688	702	712	669	689
2	582	559	570	630	595	617	720	645	700	720	678	697
3	582	530	567	637	601	621	706	682	694	720	668	690
4	570	552	561	651	595	610	697	657	681	725	676	703
5	571	548	556	639	601	615	710	665	686	733	677	708
6	570	533	547	637	607	623	703	660	685	726	682	703
7	575	548	562	644	406	628	707	673	693	715	681	698
8	584	549	567	638	586	604	707	673	692	712	677	695
9	565	525	550	611	555	569	708	677	692	702	670	687
10	547	460	531	610	560	585	708	676	693	705	671	686
11	526	408	478	646	619	632	718	686	699	707	674	692
12	572	451	466	671	651	661	734	674	698	721	681	706
13	478	464	470	689	626	667	715	680	697	734	690	707
14	509	478	492	696	665	681	731	693	712	---	---	---
15	527	505	517	702	672	684	728	688	712	---	---	---
16	546	496	524	697	670	586	740	679	711	---	---	---
17	545	498	536	717	657	700	725	675	697	---	---	---
18	541	520	533	715	680	696	718	683	699	697	665	683
19	---	---	---	707	669	685	709	675	693	699	666	685
20	---	---	---	709	673	688	714	669	692	702	647	684
21	---	---	---	699	666	684	712	676	695	722	665	691
22	---	---	---	713	680	695	724	684	702	702	652	678
23	---	---	---	713	674	695	730	691	712	736	652	637
24	---	---	---	709	680	694	728	679	710	---	---	---
25	677	644	662	711	673	697	727	692	710	---	---	---
26	674	651	663	714	682	701	714	687	700	---	---	---
27	665	624	651	718	679	697	718	664	695	765	718	744
28	693	640	661	719	694	708	726	684	704	791	741	765
29	688	644	668	714	681	701	720	677	706	780	729	755
30	658	632	646	721	681	696	726	692	711	786	748	758
31	657	631	645	---	---	---	717	684	699	790	743	757
MONTH	---	---	---	721	406	662	740	645	699	---	---	---

05345000 VERMILLION RIVER NEAR EMPIRE, MN--Continued

SPECIFIC CONDUCTANCE (MICROSIEMENS/CM AT 25 DEG. C), WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		FEBRUARY			MARCH			APRIL			MAY	
1	797	753	775	---	---	---	681	635	652	728	654	682
2	800	753	777	---	---	---	697	631	653	745	547	623
3	785	729	756	790	729	752	695	639	658	709	656	680
4	796	738	762	790	735	756	708	654	678	757	676	705
5	793	743	765	799	740	760	721	638	694	782	705	712
6	793	751	769	763	733	748	745	687	703	800	652	736
7	812	746	776	---	---	---	809	680	731	801	676	742
8	796	686	751	689	658	670	808	724	755	804	718	747
9	821	709	759	695	659	674	821	729	760	849	723	775
10	792	746	764	740	661	687	796	730	762	825	754	778
11	802	751	773	740	683	704	606	728	749	830	725	765
12	802	755	773	755	703	725	782	728	751	858	733	778
13	788	749	765	746	711	728	770	737	756	869	755	788
14	772	748	759	739	696	721	755	688	726	---	---	---
15	760	730	749	742	707	725	754	676	706	---	---	---
16	773	744	757	761	719	734	781	689	722	---	---	---
17	808	749	772	752	719	731	790	712	740	870	802	834
18	---	---	---	740	704	726	798	732	759	844	759	805
19	---	---	---	769	712	739	788	749	769	810	733	769
20	---	---	---	777	724	748	807	746	775	---	---	---
21	---	---	---	749	710	730	751	663	712	812	721	757
22	830	762	788	739	684	710	702	639	669	792	671	704
23	816	772	795	706	670	688	751	643	681	744	662	692
24	814	767	789	654	627	640	773	673	697	842	674	698
25	817	770	785	658	616	641	740	665	701	727	667	692
26	---	---	---	654	616	636	744	693	718	796	689	739
27	---	---	---	669	625	643	767	691	721	819	669	759
28	---	---	---	665	634	648	763	675	706	---	---	---
29	---	---	---	---	---	---	790	695	723	---	---	---
30	---	---	---	---	---	---	772	688	706	---	---	---
31	---	---	---	674	628	650	---	---	---	---	---	---
MONTH	---	---	---	---	---	---	821	631	718	---	---	---

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		JUNE			JULY			AUGUST			SEPTEMBER	
1	---	---	---	954	820	870	773	717	746	820	688	771
2	---	---	---	976	849	903	799	726	764	814	676	769
3	---	---	---	968	868	900	783	744	767	813	740	774
4	857	731	773	932	854	895	807	733	775	834	763	793
5	852	750	788	916	809	871	842	774	802	845	760	820
6	836	763	804	898	643	787	824	774	805	819	754	796
7	834	782	813	924	806	856	853	788	815	835	757	797
8	902	787	829	958	830	871	855	778	823	845	774	812
9	864	773	807	866	697	806	773	601	644	827	766	772
10	786	719	762	902	830	862	667	613	631	834	689	783
11	853	720	769	880	846	862	615	607	611	833	758	792
12	859	771	808	874	830	852	688	654	671	802	740	777
13	876	797	835	900	831	860	703	663	679	803	751	783
14	921	810	854	926	821	857	704	652	678	802	722	783
15	939	814	866	938	810	860	755	656	702	842	685	782
16	913	810	839	970	842	891	720	658	696	831	624	785
17	875	796	833	974	872	924	722	670	688	837	671	794
18	889	796	841	944	883	911	724	665	694	815	734	779
19	---	---	---	915	722	815	742	662	696	825	602	739
20	---	---	---	969	818	898	740	680	709	819	739	772
21	---	---	---	884	734	798	748	692	722	809	728	772
22	---	---	---	755	636	692	737	676	703	907	753	829
23	923	845	879	---	---	---	734	663	690	928	833	867
24	910	818	860	---	---	---	743	673	692	921	850	876
25	868	809	846	---	---	---	778	697	735	908	738	858
26	881	795	829	---	---	---	770	710	745	962	857	892
27	890	782	829	---	---	---	787	726	755	939	876	911
28	896	815	848	---	---	---	---	---	---	942	890	920
29	---	---	---	---	---	---	804	733	762	946	863	902
30	942	821	884	---	---	---	797	749	775	928	857	887
31	---	---	---	754	724	737	788	731	764	---	---	---
MONTH	---	---	---	---	---	---	---	---	---	962	602	813

05345000 VERMILLION RIVER NEAR EMPIRE, MN--Continued

PH (STANDARD UNITS), WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		OCTOBER			NOVEMBER			DECEMBER			JANUARY	
1	7.9	7.9	7.9	8.2	8.1	8.2	8.3	8.1	8.2	8.0	7.8	7.9
2	8.0	7.9	7.9	8.3	8.2	8.2	8.3	8.1	8.2	8.0	7.8	7.9
3	8.0	7.8	7.9	8.2	8.2	8.2	8.3	8.1	8.2	8.0	7.8	7.9
4	8.0	7.9	8.0	8.2	8.1	8.2	8.3	8.2	8.2	8.0	7.8	7.9
5	8.1	8.0	8.0	8.2	8.1	8.1	8.2	8.0	8.1	7.9	7.8	7.9
6	8.1	8.0	8.1	8.2	8.1	8.1	8.1	7.9	8.0	7.9	7.8	7.8
7	8.1	8.0	8.0	---	---	---	8.0	7.8	7.9	8.0	7.8	7.9
8	8.1	8.0	8.0	8.3	8.1	8.2	7.9	7.7	7.8	8.0	7.8	7.9
9	8.1	8.0	8.1	8.3	8.2	8.3	7.7	7.7	7.7	8.0	7.9	7.9
10	8.1	8.1	8.1	8.4	8.2	8.3	7.8	7.7	7.7	8.0	7.9	7.9
11	8.1	7.9	8.0	8.3	8.2	8.3	7.8	7.6	7.7	8.0	7.9	7.9
12	8.0	7.8	7.9	8.3	8.1	8.2	7.8	7.7	7.7	7.9	7.8	7.9
13	8.0	7.9	8.0	8.3	8.1	8.1	7.8	7.6	7.7	8.0	7.8	7.9
14	8.1	8.0	8.0	8.2	8.1	8.1	7.7	7.6	7.6	---	---	---
15	8.1	8.1	8.1	8.2	8.0	8.1	7.7	7.6	7.6	---	---	---
16	8.1	8.1	8.1	8.2	8.0	8.1	8.0	7.6	7.8	---	---	---
17	8.2	8.1	8.1	8.2	8.1	8.1	8.0	7.8	7.9	---	---	---
18	8.2	8.1	8.1	8.2	8.1	8.2	8.0	7.8	7.9	8.0	7.9	8.0
19	---	---	---	8.2	8.1	8.2	8.0	7.9	7.9	8.0	7.9	7.9
20	---	---	---	8.2	8.1	8.1	8.0	7.9	7.9	8.0	7.9	7.9
21	---	---	---	8.2	8.1	8.2	8.0	7.9	7.9	8.0	7.9	7.9
22	---	---	---	8.2	8.0	8.1	8.0	7.8	7.9	8.0	7.9	8.0
23	---	---	---	8.3	8.0	8.1	8.0	7.8	7.9	8.0	7.8	7.9
24	---	---	---	8.2	8.1	8.2	8.0	7.8	7.9	---	---	---
25	8.2	8.1	8.1	8.2	8.1	8.1	8.0	7.8	7.9	---	---	---
26	8.2	8.1	8.1	8.2	8.0	8.1	8.0	7.8	7.9	---	---	---
27	8.2	8.1	8.2	8.2	8.0	8.1	8.0	7.8	7.9	8.1	7.4	7.8
28	8.2	8.1	8.1	8.2	8.1	8.1	8.0	7.8	7.9	7.9	7.7	7.8
29	8.2	8.1	8.2	8.3	8.1	8.2	7.9	7.8	7.8	7.9	7.8	7.8
30	8.2	8.1	8.1	8.3	8.1	8.2	8.0	7.8	7.9	8.0	7.8	7.8
31	8.2	8.0	8.1	---	---	---	8.0	7.8	7.9	8.0	7.8	7.9
MONTH	---	---	---	---	---	---	8.3	7.6	7.9	---	---	---

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		FEBRUARY			MARCH			APRIL			MAY	
1	8.0	7.8	7.9	---	---	---	8.1	7.8	7.9	7.9	7.7	7.8
2	7.9	7.8	7.8	---	---	---	8.1	7.9	8.0	8.0	7.5	7.6
3	8.0	7.8	7.9	8.0	7.9	8.0	8.0	7.9	7.9	7.9	7.6	7.7
4	8.0	7.8	7.9	8.1	7.8	7.9	8.1	7.8	7.9	7.8	7.7	7.8
5	7.9	7.8	7.8	8.0	7.8	7.9	8.1	7.8	7.9	8.1	7.7	7.9
6	7.9	7.8	7.8	8.0	7.8	7.8	8.1	7.8	7.9	8.1	7.7	8.0
7	8.0	7.8	7.8	---	---	---	8.3	7.8	8.0	8.1	7.6	8.0
8	7.9	7.7	7.8	7.9	7.7	7.8	8.4	7.9	8.1	8.1	7.9	8.0
9	7.8	7.6	7.7	7.9	7.7	7.8	8.4	7.9	8.1	8.1	7.9	8.0
10	7.9	7.7	7.8	7.9	7.8	7.8	8.4	7.9	8.1	8.1	7.9	7.9
11	7.9	7.8	7.8	7.9	7.8	7.8	8.4	7.9	8.1	8.1	7.8	8.0
12	7.9	7.8	7.8	8.0	7.8	7.8	8.4	7.9	8.1	8.1	8.0	8.1
13	8.0	7.8	7.9	8.0	7.8	7.9	8.4	7.9	8.1	8.1	8.1	8.1
14	8.0	7.8	7.9	8.0	7.7	7.8	8.2	7.9	8.0	---	---	---
15	8.1	7.9	7.9	8.0	7.7	7.8	8.1	7.8	7.9	---	---	---
16	8.0	7.9	7.9	8.0	7.7	7.8	8.2	7.8	7.9	---	---	---
17	8.0	7.9	7.9	8.0	7.8	7.9	8.2	7.7	7.9	8.1	8.0	8.0
18	---	---	---	8.0	7.8	7.9	8.2	7.7	7.9	8.1	8.0	8.0
19	---	---	---	8.0	7.8	7.8	8.3	7.7	7.9	8.1	8.0	8.0
20	---	---	---	8.0	7.8	7.9	8.2	7.7	7.9	---	---	---
21	---	---	---	8.0	7.8	7.9	8.2	7.8	8.0	8.0	7.9	8.0
22	8.1	7.9	8.0	8.0	7.8	7.9	8.1	7.8	7.9	8.2	8.0	8.1
23	8.2	7.8	8.0	7.9	7.7	7.8	8.1	7.8	7.9	8.1	8.0	8.1
24	8.2	7.8	8.0	7.9	7.7	7.8	8.1	7.7	7.9	8.1	8.0	8.1
25	8.2	7.8	8.0	7.8	7.7	7.7	8.1	7.8	7.9	8.1	8.0	8.1
26	---	---	---	7.8	7.7	7.7	---	---	---	8.2	8.0	8.0
27	---	---	---	7.9	7.7	7.8	8.1	7.7	7.8	8.1	7.9	8.0
28	---	---	---	8.0	7.8	7.9	8.0	7.8	7.9	---	---	---
29	---	---	---	---	---	---	8.0	7.7	7.8	---	---	---
30	---	---	---	---	---	---	8.0	7.7	7.9	---	---	---
31	---	---	---	8.0	7.8	7.9	---	---	---	---	---	---

VERMILLION RIVER BASIN

0534500 VERMILLION RIVER NEAR EMPIRE, MN--Continued

PH (STANDARD UNITS), WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		JUNE			JULY			AUGUST			SEPTEMBER	
1	---	---	---	8.1	7.9	8.0	7.8	7.7	7.7	---	---	---
2	---	---	---	8.1	7.9	8.0	7.8	7.8	7.8	---	---	---
3	---	---	---	8.2	8.0	8.1	7.9	7.8	7.9	---	---	---
4	8.1	8.0	8.0	8.2	7.9	8.1	7.9	7.6	7.8	---	---	---
5	8.0	8.0	8.0	8.2	7.9	8.1	---	---	---	---	---	---
6	8.1	8.0	8.0	8.0	7.6	7.7	---	---	---	---	---	---
7	8.1	8.0	8.0	8.1	7.7	7.8	---	---	---	---	---	---
8	8.1	8.0	8.0	8.1	7.8	8.0	---	---	---	---	---	---
9	8.1	8.1	8.1	8.0	7.8	7.8	---	---	---	8.1	7.5	7.9
10	8.1	8.0	8.1	8.0	7.8	7.9	---	---	---	8.1	7.7	8.1
11	8.0	7.9	8.0	8.1	7.8	7.9	---	---	---	8.1	8.1	8.1
12	8.1	8.0	8.0	8.1	7.9	8.0	8.4	8.3	8.4	8.1	8.1	8.1
13	8.1	8.0	8.0	8.2	7.9	8.0	8.5	7.9	8.3	8.1	8.1	8.1
14	8.1	7.9	8.0	8.2	7.9	8.0	8.5	8.2	8.3	8.1	7.8	8.1
15	8.1	8.0	8.1	8.1	8.0	8.0	8.4	8.0	8.2	---	---	---
16	---	---	---	8.2	7.9	8.0	---	---	---	---	---	---
17	8.0	7.9	8.0	8.1	7.9	8.0	---	---	---	---	---	---
18	8.0	7.8	7.9	8.1	7.9	8.0	---	---	---	---	---	---
19	---	---	---	8.0	7.7	7.8	---	---	---	---	---	---
20	---	---	---	8.0	7.8	7.9	---	---	---	---	---	---
21	---	---	---	8.0	7.5	7.7	---	---	---	---	---	---
22	---	---	---	7.7	7.4	7.5	---	---	---	---	---	---
23	8.1	7.9	8.1	---	---	---	8.2	7.5	7.9	---	---	---
24	8.2	8.0	8.1	---	---	---	8.2	7.3	7.7	---	---	---
25	8.2	8.0	8.0	---	---	---	8.5	7.2	7.6	---	---	---
26	8.3	8.0	8.1	---	---	---	8.5	7.5	8.0	---	---	---
27	8.3	8.1	8.2	---	---	---	8.3	7.9	8.2	---	---	---
28	8.3	8.1	8.2	---	---	---	---	---	---	---	---	---
29	---	---	---	---	---	---	---	---	---	---	---	---
30	8.3	8.0	8.1	---	---	---	---	---	---	---	---	---
31	---	---	---	7.7	7.7	7.7	---	---	---	---	---	---

TEMPERATURE, WATER (DEG. C), WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		OCTOBER			NOVEMBER			DECEMBER			JANUARY	
1	14.0	11.5	13.0	7.5	5.0	6.0	5.0	3.5	4.5	3.0	1.5	2.0
2	13.0	11.5	12.0	5.5	3.5	4.5	5.0	4.0	4.5	3.0	2.0	2.5
3	14.5	11.5	12.0	6.0	5.0	5.5	5.5	3.0	3.5	4.0	1.5	2.5
4	14.0	10.5	11.0	6.0	4.0	5.0	3.0	1.0	2.0	4.0	3.5	4.0
5	11.5	10.0	11.0	6.5	4.5	5.5	3.5	1.0	2.0	4.5	3.5	4.0
6	12.5	8.5	9.5	7.5	5.0	6.0	3.5	2.0	2.5	4.5	4.0	4.0
7	12.5	9.5	11.0	9.0	7.0	7.5	3.5	2.5	3.0	4.0	3.0	3.5
8	12.5	11.0	11.5	9.0	3.5	6.5	3.5	2.5	3.0	3.5	2.0	3.0
9	11.5	10.0	10.0	5.0	1.0	2.0	3.5	.5	2.0	3.0	1.5	2.5
10	9.5	8.0	8.5	2.0	1.0	1.5	1.5	.0	.5	2.5	1.5	2.0
11	9.5	7.5	9.0	2.0	.0	1.0	2.0	.5	1.5	3.0	1.5	2.5
12	---	---	---	2.5	.5	1.5	1.0	.0	.5	4.5	2.5	3.5
13	6.5	5.5	6.0	3.0	1.0	2.0	1.5	.0	.5	5.5	3.0	4.0
14	6.5	5.0	6.0	5.0	2.0	3.0	3.5	1.5	2.5	---	---	---
15	7.5	5.5	6.5	5.5	3.5	4.5	4.5	2.5	3.5	---	---	---
16	9.0	6.5	8.0	6.0	4.0	5.0	5.5	4.0	4.5	---	---	---
17	8.5	7.0	8.0	5.5	2.0	5.0	4.5	3.5	4.0	---	---	---
18	9.0	6.5	7.5	5.5	1.5	3.5	5.0	3.5	4.0	2.0	.0	1.0
19	---	---	---	2.0	1.0	1.5	4.0	3.0	3.5	1.5	.5	1.0
20	---	---	---	3.0	1.0	2.5	3.5	2.5	3.0	1.5	.0	1.0
21	---	---	---	2.5	1.5	2.0	3.5	2.0	2.5	4.0	1.0	2.5
22	---	---	---	4.5	2.5	3.5	4.5	3.0	3.5	2.0	.0	.5
23	---	---	---	4.0	2.0	3.0	5.0	3.5	4.0	.0	.0	.0
24	---	---	---	3.5	1.5	2.5	4.5	3.5	4.0	---	---	---
25	11.0	9.5	10.0	6.0	2.5	4.5	4.0	3.5	4.0	---	---	---
26	11.0	9.5	10.0	5.5	4.5	5.0	4.0	3.0	3.5	---	---	---
27	10.5	8.0	9.0	5.5	3.5	4.5	3.0	2.0	2.5	3.5	2.0	2.5
28	10.5	8.5	9.5	6.0	4.5	5.0	4.0	3.0	3.5	5.0	2.5	4.0
29	10.0	8.5	9.5	5.5	4.5	5.0	4.5	3.5	4.0	4.0	2.5	3.5
30	8.5	7.0	8.0	5.0	4.5	4.5	4.5	3.5	4.0	5.0	3.0	4.0
31	10.0	7.5	8.5	---	---	---	3.5	2.5	3.0	4.5	2.0	3.5
MONTH	---	---	---	9.0	.0	4.0	5.5	.0	3.0	---	---	---

0534500 VERMILLION RIVER NEAR EMPIRE, MN--Continued

TEMPERATURE, WATER (DEG. C), WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		FEBRUARY			MARCH			APRIL			MAY	
1	6.0	4.0	5.0	---	---	---	7.5	5.0	6.0	14.0	11.0	11.5
2	6.0	3.0	5.0	---	---	---	8.5	3.0	5.5	16.5	10.5	12.0
3	4.5	2.0	3.5	7.0	3.0	5.5	10.0	3.5	6.5	17.0	11.0	13.5
4	5.0	3.0	3.5	8.5	4.5	6.0	11.5	5.0	8.0	17.0	10.5	14.0
5	5.5	2.5	4.0	9.0	5.0	7.0	13.0	6.5	9.5	17.0	10.5	13.5
6	6.5	4.0	5.0	10.0	6.0	7.0	14.0	7.5	10.5	18.5	11.0	14.5
7	7.5	4.5	5.5	---	---	---	14.5	8.5	11.0	18.5	11.5	14.5
8	6.0	2.0	4.0	7.0	4.5	6.0	15.5	8.5	11.5	19.5	11.5	15.0
9	5.0	1.5	3.0	5.0	2.0	3.5	15.5	9.0	12.0	22.0	14.0	17.5
10	5.5	2.5	4.0	5.0	1.0	3.0	15.0	10.0	12.0	21.5	15.5	18.0
11	7.0	4.0	5.5	6.5	2.5	4.5	14.5	9.0	11.0	21.0	15.5	18.0
12	7.0	5.0	5.5	7.0	4.5	5.5	14.5	8.0	11.0	19.5	12.5	16.0
13	7.0	4.5	5.5	6.5	5.0	6.0	12.5	10.5	11.5	19.0	12.5	15.0
14	5.5	3.0	4.5	5.5	4.0	5.0	12.0	10.0	11.0	---	---	---
15	3.5	1.5	2.5	7.0	2.5	4.5	12.0	9.5	10.5	---	---	---
16	4.5	1.5	2.5	6.5	4.0	5.0	16.0	8.5	11.5	---	---	---
17	5.0	2.0	3.5	6.5	4.0	5.0	17.0	10.0	13.5	24.0	15.5	19.5
18	---	---	---	5.5	4.5	5.0	19.0	11.5	15.0	19.0	13.0	15.5
19	---	---	---	7.5	5.0	6.0	19.5	13.5	16.5	15.0	12.0	13.5
20	---	---	---	10.5	5.5	8.0	19.5	14.5	17.0	---	---	---
21	---	---	---	8.0	6.5	7.0	15.0	10.5	12.0	22.0	17.5	20.0
22	6.5	5.0	5.5	10.5	4.5	8.0	11.0	8.5	9.5	17.0	11.5	14.0
23	7.0	4.5	6.0	10.0	8.5	9.0	15.5	7.5	11.0	17.0	10.0	13.0
24	7.5	5.5	6.0	10.5	6.5	9.0	15.5	10.5	13.0	19.0	12.5	14.0
25	7.0	4.5	5.5	9.5	8.0	9.0	17.5	10.0	13.5	14.5	12.5	13.5
26	---	---	---	8.0	6.5	7.5	18.0	12.0	15.0	20.0	13.0	16.0
27	---	---	---	9.5	6.0	7.5	17.0	12.0	14.5	22.0	16.5	19.0
28	---	---	---	8.0	6.5	7.5	17.0	9.5	13.0	---	---	---
29	---	---	---	---	---	---	18.0	11.5	14.5	---	---	---
30	---	---	---	---	---	---	17.0	10.5	13.5	---	---	---
31	---	---	---	6.5	4.0	6.0	---	---	---	---	---	---
MONTH	---	---	---	---	---	---	19.5	3.0	11.5	---	---	---

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		JUNE			JULY			AUGUST			SEPTEMBER	
1	---	---	---	25.0	16.0	20.5	24.5	21.0	23.0	18.5	12.5	15.5
2	---	---	---	25.5	18.5	21.5	26.0	19.5	22.5	18.5	13.5	16.0
3	---	---	---	25.5	17.5	21.5	22.5	19.5	21.0	18.5	13.0	16.0
4	21.0	12.5	16.5	25.5	17.5	21.5	20.0	17.0	18.5	20.5	14.5	17.5
5	23.0	14.5	18.5	24.5	19.0	21.0	21.0	15.0	18.0	21.0	18.0	19.5
6	24.5	17.0	20.5	25.0	19.5	22.0	23.5	17.0	18.0	20.0	16.0	18.0
7	25.0	18.0	21.0	24.0	18.5	22.0	21.0	16.5	18.5	18.5	14.0	16.5
8	24.5	17.5	20.5	24.5	17.5	21.0	20.0	17.5	19.0	19.0	15.0	17.0
9	21.5	15.0	18.0	25.5	18.5	22.0	21.5	17.0	19.5	17.0	13.0	15.0
10	17.0	14.0	14.5	25.5	19.5	22.0	22.5	19.5	21.0	16.0	13.0	14.5
11	21.5	14.0	17.0	23.5	19.5	21.0	22.0	19.0	20.5	17.5	13.5	15.5
12	24.5	15.5	19.5	21.5	18.0	19.5	20.0	17.5	19.0	16.0	13.5	14.5
13	25.5	15.5	20.5	21.5	16.0	18.5	19.0	16.5	17.5	17.0	12.0	14.0
14	26.5	17.0	21.5	21.5	14.5	18.0	18.0	16.5	17.0	14.5	11.5	13.5
15	25.0	16.0	20.0	23.5	15.5	19.0	22.0	16.0	18.5	18.0	12.0	15.0
16	23.5	16.0	19.5	25.5	16.5	20.5	22.0	18.5	20.0	17.0	15.5	16.0
17	20.0	17.0	18.5	28.5	20.0	24.0	21.0	16.5	18.5	16.5	15.0	15.5
18	24.5	16.0	20.0	24.5	21.0	23.0	20.5	16.0	18.0	16.5	14.0	15.0
19	---	---	---	27.0	20.0	23.5	19.5	14.5	17.0	17.5	12.5	14.5
20	---	---	---	27.0	17.5	23.5	20.5	14.5	17.5	15.0	12.5	14.0
21	---	---	---	25.5	20.0	22.5	19.0	16.5	18.0	15.5	12.0	13.5
22	---	---	---	27.0	21.0	23.5	18.5	15.0	16.5	16.5	12.0	14.0
23	23.0	18.5	21.5	---	---	---	18.0	12.5	15.0	17.5	11.5	14.5
24	23.0	16.5	19.5	---	---	---	18.0	12.0	15.0	17.0	12.5	14.5
25	22.5	17.0	19.5	---	---	---	16.0	14.0	15.0	16.5	11.0	14.0
26	20.0	15.0	17.5	---	---	---	14.5	13.5	14.0	18.5	12.5	15.5
27	22.0	13.0	17.0	---	---	---	16.0	13.5	14.5	20.0	14.5	17.0
28	24.0	15.5	18.5	---	---	---	18.0	14.0	15.5	18.0	15.0	15.5
29	---	---	---	---	---	---	19.5	13.5	16.5	17.5	14.0	15.5
30	25.0	16.5	22.0	---	---	---	18.5	15.5	17.0	16.0	12.5	14.0
31	---	---	---	26.0	23.5	25.5	17.5	12.5	15.0	---	---	---
MONTH	---	---	---	---	---	---	26.0	12.0	18.0	21.0	11.0	15.5

0534500 VERMILLION RIVER NEAR EMPIRE, MN--Continued

OXYGEN, DISSOLVED (DO), MG/L, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		OCTOBER			NOVEMBER			DECEMBER			JANUARY	
1	9.0	7.6	8.3	12.7	9.7	11.4	11.5	9.4	10.1	14.2	12.2	13.1
2	9.2	7.8	8.4	13.1	11.6	12.3	11.8	9.0	10.1	13.7	12.4	12.9
3	8.5	7.5	8.0	11.7	11.1	11.3	12.9	10.0	11.1	14.1	12.2	13.0
4	9.0	7.6	8.2	12.6	11.2	11.8	13.5	11.0	12.0	13.5	11.9	12.5
5	9.6	8.4	9.0	12.4	11.1	11.6	13.2	11.0	11.9	13.4	11.8	12.3
6	10.7	9.5	10.1	12.1	10.7	11.3	13.4	10.8	11.7	13.1	11.5	12.2
7	10.6	9.7	10.3	11.4	8.7	10.6	13.0	11.0	11.6	14.4	12.4	13.1
8	10.3	8.9	9.6	12.1	9.3	10.7	12.5	10.8	11.4	14.4	12.7	13.3
9	11.7	10.1	11.0	13.5	11.3	12.4	13.0	10.7	11.6	14.3	12.8	13.4
10	12.2	11.0	11.5	13.6	12.0	12.8	12.7	11.0	11.7	14.5	12.9	13.5
11	11.2	10.0	10.7	13.0	11.9	12.5	12.4	10.5	11.3	14.5	12.7	13.5
12	11.0	9.2	10.6	12.1	11.9	12.0	12.9	11.0	11.8	13.8	12.3	12.9
13	11.8	10.8	11.3	13.5	11.6	12.3	12.8	10.8	11.5	13.9	12.1	12.7
14	12.3	11.2	11.7	12.3	10.9	11.7	12.2	10.1	11.0	---	---	---
15	12.5	11.5	11.9	12.2	10.3	11.2	12.2	10.0	10.8	---	---	---
16	11.9	10.8	11.5	11.9	10.3	10.9	12.0	9.8	10.6	---	---	---
17	12.2	10.7	11.4	12.2	10.3	11.1	11.9	9.7	10.6	---	---	---
18	12.6	11.5	11.9	13.3	10.5	11.9	12.2	10.1	10.8	14.8	13.0	13.7
19	---	---	---	12.9	11.6	12.2	12.5	10.2	11.0	14.4	13.1	13.5
20	---	---	---	13.0	11.2	11.9	12.6	10.6	11.3	15.1	13.1	13.8
21	---	---	---	13.1	11.0	12.0	12.8	10.7	11.4	14.0	12.5	13.1
22	---	---	---	12.2	10.1	11.1	12.3	10.2	11.0	15.5	12.6	13.8
23	---	---	---	12.3	9.5	10.9	12.5	9.7	11.0	15.4	14.5	14.7
24	---	---	---	12.2	9.9	11.0	12.9	10.8	11.6	---	---	---
25	10.7	8.9	9.5	9.7	9.1	9.4	12.6	10.8	11.5	---	---	---
26	10.4	9.1	9.6	11.0	8.8	9.6	13.0	11.1	11.8	---	---	---
27	10.6	9.3	9.8	11.3	9.2	10.0	13.0	11.3	12.0	12.7	11.2	12.0
28	10.4	9.2	9.7	11.0	9.1	9.7	12.8	11.2	11.8	12.6	11.0	11.6
29	11.2	9.2	10.1	11.4	9.1	10.0	12.3	11.0	11.4	12.3	10.7	11.3
30	11.4	10.0	10.5	11.1	9.2	9.9	13.6	11.0	12.1	12.6	10.3	11.3
31	10.5	9.3	9.7	---	---	---	13.8	12.0	12.7	12.7	10.6	11.6
MONTH	---	---	---	13.6	8.7	11.3	13.8	9.0	11.4	---	---	---

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		FEBRUARY			MARCH			APRIL			MAY	
1	11.8	9.9	10.7	---	---	---	13.9	10.9	12.2	8.4	7.0	8.0
2	11.1	9.7	10.2	---	---	---	14.4	11.6	12.7	9.6	6.5	7.4
3	12.9	9.9	11.3	13.8	11.1	12.7	14.3	11.0	12.5	9.2	7.2	8.0
4	12.8	11.1	11.7	13.5	10.5	11.6	14.2	10.6	12.1	9.1	7.2	8.1
5	13.0	10.8	11.7	13.3	10.3	11.5	14.0	10.1	11.9	9.8	7.3	8.5
6	12.7	10.1	11.3	12.7	10.2	10.9	13.9	9.5	11.2	9.2	7.5	8.5
7	12.9	9.9	10.8	---	---	---	13.7	8.9	10.8	9.2	7.4	8.3
8	12.7	9.8	11.2	11.9	9.2	11.1	13.3	8.4	10.5	9.0	7.0	8.1
9	11.6	10.4	10.9	13.7	11.0	12.3	13.8	8.1	10.4	8.1	6.3	7.3
10	13.6	10.7	11.9	13.7	11.6	12.5	12.9	8.0	10.0	8.1	6.0	6.8
11	13.0	10.9	11.7	13.2	11.2	12.0	13.4	7.4	9.6	8.0	5.3	6.9
12	13.7	11.1	12.1	13.2	10.7	11.7	13.3	8.0	10.2	9.2	7.2	8.1
13	13.8	11.4	12.2	12.7	10.5	11.4	12.3	7.4	9.3	9.1	7.7	8.3
14	13.8	11.0	12.2	13.1	10.2	11.4	13.1	7.3	9.6	---	---	---
15	15.0	12.4	13.5	13.3	11.0	11.9	12.9	7.9	9.8	---	---	---
16	14.7	12.4	13.3	13.1	10.7	11.6	12.9	8.1	10.2	---	---	---
17	13.6	11.4	12.4	13.2	10.7	11.6	12.3	7.5	9.5	7.5	6.5	7.0
18	---	---	---	12.5	10.4	11.3	12.0	6.9	8.9	7.6	6.5	7.0
19	---	---	---	12.6	10.1	11.1	10.4	6.1	7.9	8.5	7.2	7.7
20	---	---	---	12.6	9.6	10.9	9.8	5.5	7.3	---	---	---
21	---	---	---	12.4	9.3	10.5	11.9	6.5	9.0	7.6	7.4	7.5
22	13.4	10.4	11.5	12.5	9.1	10.9	11.3	8.0	9.3	9.9	6.4	8.6
23	13.9	10.5	11.7	11.2	8.7	9.6	12.0	8.2	10.0	10.2	8.6	9.5
24	14.0	10.0	11.5	12.2	8.9	10.2	11.3	7.5	9.0	9.5	7.0	9.2
25	14.0	10.3	11.7	10.7	8.6	9.6	10.9	7.3	8.8	---	---	---
26	---	---	---	11.2	9.2	10.1	10.3	6.7	8.2	---	---	---
27	---	---	---	12.3	9.9	10.9	10.5	6.7	8.4	---	---	---
28	---	---	---	12.5	9.5	10.7	10.7	7.5	8.8	---	---	---
29	---	---	--	---	---	---	10.2	6.7	8.2	---	---	---
30	---	---	---	---	---	---	10.3	6.9	8.3	---	---	---
31	---	---	---	13.8	11.4	12.9	---	---	---	---	---	---
MONTH	---	---	---	---	---	---	14.4	5.5	9.8	---	---	---

OXYGEN, DISSOLVED (DO), MG/L, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		JUNE			JULY			AUGUST			SEPTEMBER	
1	---	---	---	9.6	7.0	8.1	---	---	---	9.6	8.1	8.9
2	---	---	---	8.7	6.4	7.5	---	---	---	9.7	7.5	8.6
3	---	---	---	8.7	5.8	7.2	---	---	---	9.6	7.9	8.9
4	10.0	8.3	9.3	8.8	5.7	7.0	---	---	---	8.2	6.0	7.4
5	9.2	7.5	8.5	9.2	6.2	7.4	8.2	7.2	7.8	---	---	---
6	8.5	7.5	7.9	---	---	---	7.6	4.5	7.1	8.5	6.5	7.5
7	8.8	7.3	7.8	9.6	7.5	8.5	7.8	6.7	7.2	8.8	6.9	7.9
8	8.4	7.2	7.7	9.6	6.9	8.1	---	---	---	8.5	7.1	7.8
9	9.1	7.3	8.1	8.0	6.6	7.4	---	---	---	9.2	7.3	8.3
10	9.7	7.6	8.5	8.6	6.5	7.6	---	---	---	9.4	7.4	8.3
11	8.8	7.3	8.3	8.6	6.8	7.7	7.0	5.1	6.1	9.1	7.1	8.0
12	8.4	6.8	7.6	8.8	7.1	7.9	7.6	6.3	6.9	9.3	7.0	8.2
13	8.8	6.6	7.3	9.0	8.2	8.6	8.4	7.5	7.9	9.9	7.8	8.9
14	8.0	6.5	7.2	8.6	6.8	7.7	8.1	7.4	7.7	10.8	8.2	9.5
15	8.3	6.5	7.5	9.8	6.6	8.1	7.9	6.7	7.5	10.9	8.7	9.8
16	8.3	6.6	7.3	10.3	7.2	8.8	7.3	6.3	6.9	9.5	7.3	8.2
17	7.3	6.5	6.7	8.8	6.2	7.4	8.2	6.7	7.5	8.0	6.4	7.3
18	7.0	5.0	6.3	9.0	6.1	7.2	8.3	7.3	7.8	9.2	7.5	8.2
19	---	---	---	7.9	6.1	6.9	8.6	6.3	7.7	10.2	7.6	8.8
20	---	---	---	9.1	5.6	6.2	9.0	7.5	8.2	10.3	8.6	9.5
21	---	---	---	7.7	7.0	7.4	8.1	7.2	7.6	10.3	8.3	9.1
22	---	---	---	6.3	5.3	5.9	9.2	7.2	8.3	10.2	8.2	9.0
23	8.8	6.9	7.9	---	---	---	10.0	8.6	9.3	10.3	8.0	8.7
24	9.0	6.8	7.8	---	---	---	10.0	8.5	9.2	10.2	8.2	9.0
25	8.7	6.9	7.8	---	---	---	9.0	7.4	8.4	10.7	8.2	9.2
26	9.2	7.0	8.1	---	---	---	8.3	7.0	7.6	9.9	7.9	8.7
27	10.4	7.3	8.4	---	---	---	8.5	7.3	7.8	9.3	7.2	8.3
28	10.0	7.7	8.6	---	---	---	8.6	6.8	7.6	9.3	7.0	8.2
29	---	---	---	---	---	---	9.2	7.4	8.1	9.7	7.0	8.4
30	9.5	6.9	8.5	---	---	---	9.9	8.0	9.0	9.6	7.3	8.3
31	---	---	---	---	---	---	10.0	8.7	9.3	---	---	---

CANNON RIVER BASIN

05353800 STRAIGHT RIVER NEAR FARIBAULT, MN

LOCATION.--Lat 44°15'29", long 93°13'51", in W½SE¼ sec.9, T.109 N., R.20 W., Rice County, Hydrologic Unit 07040002, on right bank 15 ft downstream from highway bridge, 2.8 mi upstream from Falls Creek and 3.2 mi southeast of Faribault.

DRAINAGE AREA.--442 mi^2.

PERIOD OF RECORD.--October 1965 to current year.

GAGE.--Water-stage recorder. Datum of gage is 1,034.58 ft above National Geodetic Vertical Datum of 1929.

REMARKS.--Records good.

AVERAGE DISCHARGE.--22 years, 268 ft^3/s, 8.23 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 5,990 ft^3/s, May 1, 1973, gage height, 11.20 ft; maximum gage height, 12.74 ft, Mar. 5, 1974 (backwater from ice); minimum discharge, 10 ft^3/s, Oct. 27, 1976; minimum gage height, 3.66 ft, Nov. 27, 1976.

EXTREMES FOR CURRENT YEAR.--Peak discharge greater than base discharge of 1,500 ft^3/s and maximum (*):

Date	Time	Discharge (ft^3/s)	Gage height (ft)	Date	Time	Discharge (ft^3/s)	Gage height (ft)
Oct. 13	0930	*2,250	*8.06	No other peak greater than base discharge.			

Minimum discharge, 35 ft^3/s, June 16, 17, gage height, 3.85 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	463	306	226	120	127	88	160	81	111	59	122	71
2	405	296	232	119	136	83	146	79	99	52	96	64
3	545	292	230	117	163	86	135	78	86	47	165	58
4	795	282	196	131	156	97	127	73	76	40	270	52
5	873	274	178	124	156	130	121	70	71	38	175	49
6	764	265	e185	125	150	163	119	67	63	39	128	46
7	614	256	e195	127	172	198	117	66	59	45	100	43
8	507	271	e183	121	236	206	118	63	50	46	101	42
9	427	256	176	101	191	168	118	61	47	61	495	43
10	379	236	139	124	205	133	117	61	48	116	484	41
11	586	211	e143	114	181	128	117	98	64	125	327	46
12	2020	e200	e148	131	185	118	113	76	53	137	230	46
13	2200	190	154	132	213	112	109	70	48	307	182	42
14	1930	e187	159	128	185	119	110	137	42	396	154	39
15	1530	e182	170	104	119	115	117	134	37	413	137	42
16	1250	e183	173	81	121	110	119	105	35	299	130	45
17	988	e184	170	e82	116	105	112	86	35	206	113	54
18	773	e185	165	e84	116	108	108	81	44	152	103	51
19	652	186	160	e87	116	120	102	81	37	164	92	49
20	589	218	151	e90	117	123	100	90	35	122	83	54
21	535	197	144	e94	107	128	99	121	38	104	80	56
22	495	229	150	e95	115	134	97	121	46	88	83	56
23	465	216	153	e93	106	141	105	101	151	78	88	56
24	437	178	153	e95	99	151	103	88	272	151	76	54
25	410	222	150	e93	85	180	100	85	236	129	69	52
26	391	214	144	e96	82	200	98	90	158	123	65	50
27	373	191	128	e100	85	210	93	111	112	110	64	48
28	352	218	141	e110	86	202	88	105	89	187	107	45
29	322	236	141	e115	---	189	84	100	86	169	98	47
30	286	230	138	e118	---	172	87	136	69	205	94	45
31	306	---	120	e120	---	169	---	137	---	162	80	---
TOTAL	22662	6791	5095	3371	3926	4386	3339	2852	2397	4370	4591	1486
MEAN	731	226	164	109	140	141	111	92.0	79.9	141	148	49.5
MAX	2200	306	232	132	236	210	160	137	272	413	495	71
MIN	286	178	120	81	82	83	84	61	35	38	64	39
AC-FT	44950	13470	10110	6690	7790	8700	6620	5660	4750	8670	9110	2950
CFSM	1.65	.51	.37	.25	.32	.32	.25	.21	.18	.32	.34	.11
IN.	1.91	.57	.43	.28	.33	.37	.28	.24	.20	.37	.39	.13

CAL YR 1986 TOTAL 167726 MEAN 460 MAX 4400 MIN 48 AC-FT 332700 CFSM 1.04 IN. 14.12
WTR YR 1987 TOTAL 65266 MEAN 179 MAX 2200 MIN 35 AC-FT 129500 CFSM .40 IN. 5.49

e Estimated

05372995 SOUTH FORK ZUMBRO RIVER AT ROCHESTER, MN

LOCATION.--Lat 44°03'42", long 92°27'58", in NW¼NE¼ sec.23, T.107 N., R.14 W., Olmsted County, Hydrologic Unit 07040004, on left bank 50 ft downstream from 37th Street bridge, 0.2 mi upstream from sewer plant, and 2.0 mi downstream from Silver Lake Dam.

DRAINAGE AREA.--303 mi^2.

PERIOD OF RECORD.--March 1981 to current year.

GAGE.--Water-stage recorder. Datum of gage is 950.00 ft above National Geodetic Vertical Datum of 1929.

REMARKS.--No estimated daily discharge. Records good. Slight regulation at times from Silver Lake.

AVERAGE DISCHARGE.--6 years (water years 1982-87), 248 ft^3/s, 11.11 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 5,450 ft^3/s, July 1, 1983, gage height, 14.93 ft; minimum discharge, 10 ft^3/s, Oct. 23, 1981, result of regulation; minimum gage height, 2.76 ft, July 21, 1985.

EXTREMES OUTSIDE PERIOD OF RECORD.--Flood of July 6, 1978, reached a stage of about 28.0 ft, on upstream side of bridge, discharge 30,500 ft^3/s. This is the highest known stage since at least 1908.

EXTREMES FOR CURRENT PERIOD.--Peak discharges greater than base discharge of 1,300 ft^3/s and maximum (*):

Date	Time	Discharge (ft^3/s)	Gage height (ft)	Date	Time	Discharge (ft^3/s)	Gage height (ft)
Oct. 4	0030	1,430	7.33	July 24	0430	1,530	7.57
Oct. 12	1230	*4,260	*12.82				

Minimum daily discharge, 48 ft^3/s, Sept. 30; minimum gage height, 2.76 ft, July 4.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	807	378	197	126	97	108	162	89	96	61	77	63
2	747	349	205	126	99	103	150	92	92	60	71	57
3	1140	333	204	119	108	101	140	90	86	57	77	54
4	1360	320	191	131	107	111	134	87	85	55	74	52
5	1140	309	167	125	102	176	131	87	85	53	68	75
6	903	301	196	127	102	293	127	85	82	82	70	110
7	771	294	180	123	108	257	123	84	78	60	62	75
8	683	323	174	117	164	227	119	82	79	66	63	73
9	590	296	171	109	124	188	119	81	75	87	178	66
10	551	270	125	119	127	157	118	81	75	130	80	66
11	907	244	157	113	118	154	115	134	87	101	70	68
12	3230	252	145	121	120	146	115	91	79	108	70	63
13	1990	213	136	119	116	141	107	101	76	100	65	59
14	1240	233	143	116	118	154	117	149	73	91	67	56
15	1020	232	143	107	94	145	118	100	72	89	66	56
16	904	227	150	87	96	136	122	97	71	89	97	78
17	792	223	151	107	93	131	119	90	100	71	77	59
18	704	222	150	106	93	135	111	93	87	64	67	65
19	645	211	145	99	95	140	107	104	87	144	63	71
20	608	226	139	95	93	142	101	101	90	76	58	70
21	569	213	128	99	99	139	98	94	86	67	57	68
22	532	216	139	94	98	140	118	91	81	58	56	69
23	499	214	135	80	94	151	125	89	78	55	55	65
24	466	204	134	86	95	174	119	89	74	403	53	60
25	442	205	135	82	93	207	107	90	78	154	51	56
26	421	203	135	80	95	230	101	99	70	113	52	54
27	404	202	130	85	99	217	97	110	66	94	54	52
28	390	201	133	88	100	198	94	95	67	83	179	51
29	369	198	133	91	---	189	93	99	71	78	97	49
30	349	196	133	92	---	171	90	99	64	111	77	48
31	367	---	128	90	---	165	---	100	---	105	68	---
TOTAL	25540	7508	4732	3259	2947	5126	3497	2973	2390	2965	2319	1908
MEAN	824	250	153	105	105	165	117	95.9	79.7	95.6	74.8	63.6
MAX	3230	378	205	131	164	293	162	149	100	403	179	110
MIN	349	196	125	80	93	101	90	81	64	53	51	48
AC-FT	50660	14890	9390	6460	5850	10170	6940	5900	4740	5880	4600	3780
CFSM	2.72	.83	.50	.35	.35	.55	.38	.32	.26	.32	.25	.21
IN.	3.14	.92	.58	.40	.36	.63	.43	.37	.29	.36	.28	.23

CAL YR 1986 TOTAL 137052 MEAN 375 MAX 7710 MIN 50 AC-FT 271800 CFSM 1.24 IN. 16.83
WTR YR 1987 TOTAL 65164 MEAN 179 MAX 3230 MIN 48 AC-FT 129300 CFSM .59 IN. 8.00

ZUMBRO RIVER BASIN

05374900 ZUMBRO RIVER AT KELLOGG, MN

LOCATION.--Lat 44°18'43", long 92°00'14", in SW¼ sec.22, T.110 N., R.10 W., Wabasha County, Hydrologic Unit 07040004, on right bank at downstream side of bridge on U.S. Highway 61, and 4 mi above mouth.

DRAINAGE AREA.--1,400 mi^2.

PERIOD OF RECORD.--August 1975 to current year.

GAGE.--Water-stage recorder. Datum of gage is 669.47 ft above National Geodetic Vertical Datum of 1929.

REMARKS.--Records good except those for Dec. 12-25 and Jan. 23-29, which are fair.

AVERAGE DISCHARGE.--12 years, 905 ft^3/s, 8.78 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 22,300 ft^3/s, Sept. 23, 1986, gage height, 16.07 ft; minimum daily, 140 ft^3/s, Dec. 3, 1980; minimum gage height, 1.69 ft, Dec. 2, 1980, result of freezeup.

EXTREMES OUTSIDE PERIOD OF RECORD.--A discharge of 33,000 ft^3/s, occurred on July 22, 1951, at station 05374500, 20 mi upstream; this was the greatest since 1938.

EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 3,500 ft^3/s and maximum (*):

Date	Time	Discharge (ft^3/s)	Gage height (ft)	Date	Time	Discharge (ft^3/s)	Gage height (ft)
Oct. 5	1630	3,720	6.52	July 24	1500	4,180	7.17
Oct. 14	1100	*9,170	*11.06				

Minimum discharge, 424 ft^3/s, July 5, 6, gage height, 2.37 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	2720	1500	916	762	795	691	917	621	610	479	747	539
2	2430	1480	932	706	797	738	781	636	661	484	651	549
3	2430	1460	936	751	826	707	765	600	631	457	684	504
4	2830	1410	911	728	782	686	796	570	546	481	757	482
5	3590	1380	755	723	817	840	765	561	578	449	771	490
6	3510	1350	779	723	773	948	747	556	505	461	670	480
7	3000	1330	817	626	825	981	682	556	527	505	660	494
8	2560	1320	893	706	706	1010	682	551	521	486	651	528
9	2330	1290	886	751	803	999	698	513	498	564	705	512
10	2130	1260	810	723	801	982	663	499	483	512	802	489
11	2130	1220	883	647	826	1010	637	532	501	776	949	526
12	3690	1200	e860	663	722	1020	630	541	493	1620	838	532
13	6280	1170	e840	728	740	966	628	522	490	1110	782	502
14	8710	1220	e820	706	748	837	725	551	487	1180	741	496
15	5690	1180	e820	658	729	757	728	700	484	1110	692	511
16	3750	1180	e840	669	754	771	706	652	481	918	702	530
17	3140	1170	e860	658	710	694	657	626	481	864	631	538
18	2850	1180	e860	685	669	506	647	621	481	802	661	540
19	2560	1160	e830	722	682	506	626	631	609	769	644	522
20	2340	1160	e780	698	650	741	621	621	569	707	601	590
21	2180	1140	e730	700	657	783	673	642	514	743	604	596
22	2120	1130	e710	672	654	706	652	642	512	662	587	534
23	2070	1130	e720	e700	640	723	690	585	548	590	521	539
24	1960	1120	e725	e720	635	751	706	621	595	2440	450	549
25	1890	998	e735	e740	635	796	631	590	535	2380	473	567
26	1810	951	751	e760	639	922	647	575	479	1530	493	546
27	1750	926	757	e790	626	981	621	575	455	1130	479	500
28	1710	917	797	e820	677	1020	580	668	487	951	515	509
29	1660	913	717	e840	---	1060	626	695	509	811	525	534
30	1670	913	751	826	---	985	621	590	479	851	608	519
31	1510	---	712	812	--	940	---	541	---	746	559	---
TOTAL	89000	35758	25133	22413	20318	26057	20548	18384	15749	27568	20153	15747
MEAN	2871	1192	811	723	726	841	685	593	525	889	650	525
MAX	8710	1500	936	840	826	1060	917	700	661	2440	949	596
MIN	1510	913	710	626	626	506	580	499	455	449	450	480
AC-FT	176500	70930	49850	44460	40300	51680	40760	36460	31240	54680	39970	31230
CFSM	2.05	.85	.58	.52	.52	.60	.49	.42	.37	.64	.46	.37
IN.	2.36	.95	.67	.60	.54	.69	.55	.49	.42	.73	.54	.42

CAL YR 1986 TOTAL 559310 MEAN 1532 MAX 19900 MIN 410 AC-FT 1109000 CFSM 1.09 IN. 14.86
WTR YR 1987 TOTAL 336828 MEAN 923 MAX 8710 MIN 449 AC-FT 668100 CFSM .66 IN. 8.95

e Estimated

WHITEWATER RIVER BASIN

05376000 NORTH FORK WHITEWATER RIVER NEAR ELBA, MN
(Hydrologic bench-mark station)

LOCATION.--Lat 44°05'30", long 92°03'57", in sec.7, T.107 N., R.10 W., Winona County, Hydrologic Unit 07040003, on left bank 2.3 mi upstream from Middle Fork, 2.4 mi west of Elba, and 3.5 mi upstream from confluence with South Fork.

DRAINAGE AREA.--101 mi^2.

WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--May 1939 to September 1941, July 1967 to current year.

REVISED RECORDS.--WRD MN-74: 1967(M), 1969(M), 1971(M), 1972(M), 1973(M). WRD MN-80-2: 1978.

GAGE.--Water-stage recorder. Datum of gage is 769.60 ft above National Geodetic Vertical Datum of 1929. Prior to Oct. 12, 1939, nonrecording gage at site 2 mi downstream at different datum. Oct. 12, 1939, to Sept. 30, 1941, water-stage recorder at site 600 ft downstream at present datum. Prior to July 6, 1978, water-stage recorder at same site and present datum (gage destroyed by flood of July 1978), July 6 to Oct. 30, 1978, nonrecording gage at same site and present datum.

REMARKS.--Records good.

AVERAGE DISCHARGE.--22 years (water years 1940-41, 1968-87), 48.3 ft^3/s, 6.49 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 16,100 ft^3/s, June 21, 1974, gage height, 16.32 ft, from floodmark; minimum, 1[illegible] ft^3/s, Feb. 21, 1968.

EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 600 ft^3/s and maximum (*).

Date		Discharge (ft^3/s)	Gage height (ft)	Date	Time	Discharge (ft^3/s)	Gage height (ft)
Oct. 12	[illegible]	*640	*6.17				

No other peak greater than base discharge.

Minimum discharge, 31 ft^3/s, July 17, Aug. 8; minimum gage height, 4.21 ft, Aug. 8.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	128	91	67	54	44	44	48	43	42	34	37	37
2	121	86	65	52	44	40	46	46	40	32	35	37
3	206	85	65	52	49	39	45	45	38	33	34	36
4	201	84	65	51	50	41	45	42	37	33	35	36
5	161	82	64	51	47	72	45	39	36	33	35	37
6	133	82	62	51	46	130	43	39	35	35	33	44
7	129	81	62	51	49	97	44	39	35	36	32	42
8	128	84	59	51	101	72	45	39	35	34	32	39
9	116	76	59	50	65	56	45	39	35	50	53	38
10	113	72	54	50	54	49	45	40	35	41	51	36
11	166	69	58	50	51	48	46	43	37	43	43	38
12	511	66	57	49	50	46	45	41	37	72	39	38
13	234	63	55	49	50	45	44	40	37	45	39	39
14	182	68	57	50	50	49	45	45	36	38	40	37
15	161	68	58	50	47	49	45	42	34	35	40	37
16	151	68	58	47	44	44	45	39	34	34	44	39
17	138	67	58	51	43	45	45	39	38	33	42	40
18	129	68	58	50	40	45	45	37	41	33	40	39
19	123	67	58	49	41	46	44	37	39	36	38	39
20	121	69	58	47	40	46	43	41	37	39	37	41
21	115	67	55	46	40	46	43	39	37	38	37	39
22	109	67	57	47	40	46	45	37	35	34	36	39
23	106	68	57	e49	41	48	47	36	35	32	36	38
24	103	64	55	50	41	50	46	35	36	106	35	37
25	100	62	55	49	40	52	44	36	37	88	35	37
26	98	64	55	46	40	54	44	39	36	61	36	37
27	95	64	[illegible]5	46	40	52	41	40	34	51	36	36
28	94	65	[illegible]	46	41	49	41	40	35	44	46	37
29	92	65	5[illegible]	46	---	48	42	42	36	40	46	36
30	89	65	55	45	---	46	43	44	35	39	41	36
31	91	---	55	44	---	47	---	47	---	38	38	---
TOTAL	4444	2147	1806	1519	1328	1641	1334	1250	1094	1340	1201	1143
MEAN	143	71.6	58.3	49.0	47.4	52.9	44.5	40.3	36.5	43.2	38.7	38.1
MAX	511	91	67	54	101	130	48	47	42	106	53	44
MIN	89	62	54	44	40	39	41	35	34	32	32	36
AC-FT	8810	4260	3580	3010	2630	3250	2650	2480	2170	2660	2380	2270
CFSM	1.42	.71	.58	.49	.47	.52	.44	.40	.36	.43	.38	.38
IN.	1.64	.79	.67	.56	.49	.60	.49	.46	.40	.49	.44	.42

CAL YR 1986 TOTAL 27034 MEAN 74.1 MAX 1520 MIN 16 AC-FT 53620 CFSM .73 IN. 9.96
WTR YR 1987 TOTAL 20247 MEAN 55.5 MAX 511 MIN 32 AC-FT 40160 CFSM .55 IN. 7.46

e Estimated

05376000 NORTH FORK WHITEWATER RIVER NEAR ELBA, MN--Continued
(Hydrologic bench-mark station)

WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1967 to current year.

REMARKS.--Letter K indicates non-ideal colony count.

WATER QUALITY DATA, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (CFS) (00061)	SPE-CIFIC CON-DUCT-ANCE (US/CM) (00095)	SPE-CIFIC CON-DUCT-ANCE LAB (US/CM) (90095)	PH (STAND-ARD UNITS) (00400)	PH LAB (STAND-ARD UNITS) (00403)	TEMPER-ATURE AIR (DEG C) (00020)	TEMPER-ATURE WATER (DEG C) (00010)	TUR-BID-ITY (NTU) (00076)	BARO-METRIC PRES-SURE (MM OF HG) (00025)	OXYGEN, DIS-SOLVED (MG/L) (00300)	COLI-FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML) (31625)
DEC												
16...	1330	55	571	549	8.2	8.1	-2.0	2.0	0.50	767	13.6	K5
JAN												
14...	1415	51	600	598	8.3	8.2	0.0	3.5	0.50	759	13.9	<1
MAR												
26...	1100	57	560	561	8.2	8.0	6.0	7.5	11	760	12.1	--
MAY												
05...	1100	39	540	597	8.0	8.3	15.5	12.5	2.5	776	11.7	K5
JUL												
15...	1300	36	550	567	8.6	8.4	29.5	18.5	2.3	766	--	77
SEP												
17...	1230	40	554	582	8.5	8.2	--	15.0	1.1	759	11.3	67

DATE	STREP-TOCOCCI FECAL, KF AGAR (COLS. PER 100 ML) (31673)	CALCIUM DIS-SOLVED (MG/L AS CA) (00915)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG) (00925)	SODIUM, DIS-SOLVED (MG/L AS NA) (00930)	POTAS-SIUM, DIS-SOLVED (MG/L AS K) (00935)	ALKA-LINITY WATER DISSOLV FLD. AS CACO3 (MG/L) (39086)	CAR-BONATE WATER DISSOLV FIELD AS CO3 (MG/L) (00452)	BICAR-BONATE WATER DISSOLV FIELD AS HCO3 (MG/L) (00453)	SULFATE DIS-SOLVED (MG/L AS SO4) (00945)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL) (00940)	FLUO-RIDE, DIS-SOLVED (MG/L AS F) (00950)
DEC											
16...	K12	92	28	7.0	1.5	270	0	329	18	18	0.1
JAN											
14...	K1	80	28	7.0	1.5	267	0	326	18	14	0.1
MAR											
26...	51	81	27	7.2	1.5	280	0	342	20	16	0.1
MAY											
05...	100	76	27	5.8	1.6	266	0	324	18	12	0.1
JUL											
15...	K510	73	27	7.8	1.8	275	11	314	16	15	0.2
SEP											
17...	260	77	28	8.5	1.8	276	13	310	18	13	0.2

DATE	SILICA, DIS-SOLVED (MG/L AS SIO2) (00955)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L) (70300)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N) (00631)	NITRO-GEN, AMMONIA DIS-SOLVED (MG/L AS N) (00608)	NITRO-GEN,AM-MONIA + ORGANIC TOTAL (MG/L AS N) (00625)	PHOS-PHORUS, TOTAL (MG/L AS P) (00665)	PHOS-PHORUS, DIS-SOLVED (MG/L AS P) (00666)	PHOS-PHORUS, ORTHO, DIS-SOLVED (MG/L AS P) (00671)	SEDI-MENT, SUS-PENDED (MG/L) (80154)	SEDI-MENT, DIS-CHARGE, SUS-PENDED (T/DAY) (80155)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM (70331)
DEC											
16...	15	348	5.5	<0.01	0.80	0.15	0.14	0.13	--	--	--
JAN											
14...	14	331	5.4	<0.01	0.20	0.13	0.12	0.11	26	3.6	12
MAR											
26...	12	319	3.5	0.02	0.50	0.24	0.22	0.12	37	5.7	40
MAY											
05...	12	327	3.5	0.02	1.3	0.12	0.10	0.09	26	2.7	42
JUL											
15...	15	340	3.1	0.05	0.90	0.21	0.16	0.16	24	2.4	67
SEP											
17...	16	318	3.2	0.02	0.20	0.22	0.15	0.14	43	4.6	77

WHITEWATER RIVER BASIN

05376000 NORTH FORK WHITEWATER RIVER NEAR ELBA, MN--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	TIME	ALUMINUM, DISSOLVED (UG/L AS AL) (01106)	ARSENIC DISSOLVED (UG/L AS AS) (01000)	BARIUM, DISSOLVED (UG/L AS BA) (01005)	BERYLLIUM, DISSOLVED (UG/L AS BE) (01010)	CADMIUM DISSOLVED (UG/L AS CD) (01025)	CHROMIUM, DISSOLVED (UG/L AS CR) (01030)	COBALT, DISSOLVED (UG/L AS CO) (01035)	COPPER, DISSOLVED (UG/L AS CU) (01040)	IRON, DISSOLVED (UG/L AS FE) (01046)	LEAD, DISSOLVED (UG/L AS PB) (01049)
DEC											
16...	1330	<10	<1	63	<0.5	<1	<1	<3	2	7	<5
JAN											
14...	1415	<10	1	60	<0.5	<1	<1	<3	<1	6	<5
MAR											
26...	1100	20	<1	62	<0.5	<1	<1	<3	<1	3	<5
SEP											
17...	1230	<10	<1	59	<0.5	<1	<1	<3	2	3	<5

DATE	LITHIUM DISSOLVED (UG/L AS LI) (01130)	MANGANESE, DISSOLVED (UG/L AS MN) (01056)	MERCURY DISSOLVED (UG/L AS HG) (71890)	MOLYBDENUM, DISSOLVED (UG/L AS MO) (01060)	NICKEL, DISSOLVED (UG/L AS NI) (01065)	SELENIUM, DISSOLVED (UG/L AS SE) (01145)	SILVER, DISSOLVED (UG/L AS AG) (01075)	STRONTIUM, DISSOLVED (UG/L AS SR) (01080)	VANADIUM, DISSOLVED (UG/L AS V) (01085)	ZINC, DISSOLVED (UG/L AS ZN) (01090)
DEC										
16...	10	18	0.1	<10	<1	<1	<1	84	<6	22
JAN										
14...	11	17	0.1	<10	<1	<1	<1	81	<6	4
MAR										
26...	10	32	<0.1	<10	1	<1	<1	82	<6	13
SEP										
17...	<4	20	0.2	<10	1	<1	<1	78	<6	7

RADIOCHEMICAL ANALYSES, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	TIME	GROSS ALPHA, DISSOLVED (UG/L AS U-NAT) (80030)	GROSS ALPHA, SUSP. TOTAL (UG/L AS U-NAT) (80040)	GROSS BETA, DISSOLVED (PCI/L AS CS-137) (03515)	GROSS BETA, SUSP. TOTAL (PCI/L AS CS-137) (03516)	GROSS BETA, DISSOLVED (PCI/L AS SR/YT-90) (80050)	GROSS BETA, SUSP. TOTAL (PCI/L AS SR/YT-90) (80060)	RADIUM 226, DISSOLVED, RADON METHOD (PCI/L) (09511)	URANIUM NATURAL DISSOLVED (UG/L AS U) (22703)
MAR									
26...	1100	0.5	<0.4	2.1	<0.4	1.5	<0.4	0.04	--
SEP									
17...	1230	0.9	<0.4	3.3	<0.4	2.4	<0.4	0.05	0.6

GARVIN BROOK BASIN

05378235 GARVIN BROOK NEAR MINNESOTA CITY, MN

LOCATION.--Lat 44°04'16", long 91°45'51", in SE¼NE¼ sec. 15, T.107 N., R.8 W., Winona County, Hydrologic Unit 07040003, on left bank, 20 ft downstream from County 23 bridge, 1.8 mi south of Minnesota City, and 2.3 mi upstream from Rollingstone Creek.

WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--March 1982 to November 1983, January 1984 to current year (partial winter records in 1984).

GAGE.--Water stage recorder and broad-crested weir.

REMARKS.--Records good except those for Nov. 13, Dec. 10-15, Jan. 16, 19, 20, 22-28, which are fair.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge 1,580 ft^3/s, Sept. 21, 1986, gage height, 6.63 ft; minimum, 15 ft^3/s, Mar. 9, 1982, gage height, 0.75 ft, result of freezeup.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 484 ft^3/s, July 30, gage height, 4.01 ft; minimum discharge, 16 ft^3/s, Feb. 24, Aug. 30, gage height, 0.82 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	44	41	34	32	29	33	36	35	38	35	37	30
2	44	40	34	32	29	43	34	39	46	36	27	30
3	61	41	34	32	29	30	34	37	33	35	35	31
4	53	39	34	32	29	30	34	35	44	35	35	31
5	48	39	33	32	29	29	34	34	38	32	34	31
6	47	39	33	33	29	41	34	35	38	32	34	40
7	50	39	33	32	30	53	35	34	38	34	47	27
8	49	40	33	32	31	25	35	34	37	35	24	38
9	46	37	33	32	29	33	36	36	37	40	36	33
10	46	37	e33	32	29	32	36	35	37	34	34	31
11	86	37	e32	32	30	33	36	43	38	35	32	23
12	114	37	e32	32	30	33	36	37	38	39	33	30
13	59	e36	e32	33	30	32	35	36	37	34	34	30
14	56	33	e32	31	30	34	37	42	36	34	33	30
15	54	26	e32	31	29	33	37	37	35	34	41	31
16	51	35	32	e30	29	32	37	37	34	32	38	32
17	50	35	32	29	29	32	36	36	35	32	36	32
18	49	34	32	29	29	33	36	36	38	31	33	32
19	48	34	32	e29	29	34	36	36	74	33	33	30
20	48	35	32	e29	29	34	36	36	53	33	32	31
21	47	34	31	29	29	34	36	36	41	34	33	32
22	45	34	31	e29	31	34	39	36	39	32	32	31
23	45	34	31	e29	36	34	39	36	37	24	32	32
24	45	34	31	e29	22	34	37	35	37	49	32	35
25	44	34	31	e29	29	36	36	36	37	30	32	25
26	46	34	31	e29	29	36	35	39	37	33	32	31
27	43	34	32	e29	30	34	36	37	36	40	32	31
28	42	34	32	e29	31	34	35	38	38	35	35	31
29	41	34	32	29	---	34	36	39	43	24	38	31
30	41	34	32	29	---	34	36	39	37	81	21	31
31	41	---	32	29	---	35	---	37	---	78	30	---
TOTAL	1583	1074	1000	945	824	1058	1075	1138	1186	1145	1037	933
MEAN	51.1	35.8	32.3	30.5	29.4	34.1	35.8	36.7	39.5	36.9	33.5	31.1
MAX	114	41	34	33	36	53	39	43	74	81	47	40
MIN	41	26	31	29	22	25	34	34	33	24	21	23
AC-FT	3140	2130	1980	1870	1630	2100	2130	2260	2350	2270	2060	1850

CAL YR 1986 TOTAL 13927 MEAN 38.2 MAX 477 MIN 26 AC-FT 27620
WTR YR 1987 TOTAL 12998 MEAN 35.6 MAX 114 MIN 21 AC-FT 25780

e Estimated

MISSISSIPPI RIVER MAIN STEM

05378500 MISSISSIPPI RIVER AT WINONA, MN

LOCATION.--Lat 44°03'21", long 91°38'16", in sec.23, T.107 N., R.7 W., Winona County, Hydrologic Unit 07040003, on right bank at Winona pumping station in Winona, 9.5 mi upstream from Trempealeau River, and at mile 725.7 upstream from the Ohio River.

DRAINAGE AREA.--59,200 mi^2, approximately.

WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--June 1928 to current year. Gage-height records collected in this vicinity since 1878 are contained in reports of Mississippi River Commission.

GAGE.--Water-stage recorder. Datum of gage is 639.64 ft above National Geodetic Vertical Datum of 1929. June 10, 1928, to Apr. 15, 1931, nonrecording gage at site 800 ft upstream. Prior to Oct. 1, 1929, at datum 0.20 ft higher and Oct. 1, 1929, to Apr. 15, 1931, at datum 0.12 ft lower. Apr. 16, 1931, to Nov. 12, 1934, nonrecording gage at present site and datum. Since Mar. 31, 1937, auxiliary water-stage recorder 2.7 mi upstream at tailwater of navigation dam 5A.

REMARKS.--No estimated daily discharges. Records good. Some regulation by reservoirs, navigation dams, and powerplants at low and medium stages. Flood flow not materially affected by artificial storage.

AVERAGE DISCHARGE.--59 years, 28,010 ft^3/s, 6.43 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 268,000 ft^3/s, Apr. 18, 1965, gage height, 20.77 ft, from floodmark; minimum, 1,940 ft^3/s, Dec. 12, 1980, gage height, 3.96 ft, result of ice jam; minimum gage height, -3.38 ft, Aug. 31, 1934 (prior to dam construction in 1936); minimum gage height since 1938, after completion of dam, 1.95 ft, Jan. 27, 1944.

EXTREMES OUTSIDE PERIOD OF RECORD.--Flood of June 18, 1880, reached an elevation of 657.14 ft, discharge, 172,000 ft^3/s, from information by U.S. Army Corps of Engineers.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 134,000 ft^3/s, Oct. 1, gage height, 14.29 ft, was not independent of peak discharge that occurred Sept. 27, 1986; maximum independent peak discharge, 40,900 ft^3/s, July 29, gage height, 6.65; minimum daily discharge, 12,100 ft^3/s, Sept. 5; minimum gage height, 5.08 ft, Sept. 1.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	134000	50200	36100	27900	23200	24900	38500	21300	30700	16300	35300	13700
2	132000	49800	36000	28000	23400	24000	38300	20900	31600	14000	31700	13000
3	128000	47500	35700	27900	23600	22600	37700	21300	31900	14000	26300	12900
4	122000	46200	35600	26700	23500	21000	36500	21500	31900	14300	24700	13100
5	116000	46100	34800	26600	23000	20500	35300	20900	31700	12800	22600	12100
6	108000	45900	33700	27300	23400	20700	34400	20500	31400	13200	19800	13300
7	102000	44900	32900	28800	22900	22600	33000	20600	30900	14300	18000	13500
8	95800	43500	31600	28500	22500	24600	32300	20600	29400	16600	17200	14200
9	91700	42100	30500	25600	22700	25300	31100	20300	26100	17800	18100	14500
10	86200	42700	30100	25000	22200	28800	29800	18500	24300	17400	22200	13500
11	82400	44400	27300	24200	22100	31400	28900	15100	23200	17000	22700	12600
12	82200	45000	22900	23500	21500	32600	28700	12800	23000	17100	20800	12300
13	81400	44300	23600	23700	21200	30800	28700	14600	23100	17100	19000	13000
14	83900	40300	26500	24000	22100	29300	29000	19200	22600	15100	16800	13600
15	90100	37500	27500	26600	22200	28700	29800	22200	20700	14100	15900	14300
16	94600	35800	30400	23200	22100	28100	29200	20900	17900	13300	17800	14200
17	95000	33600	31300	23100	21900	27400	29000	17400	15000	12700	18900	14300
18	90600	31900	34500	23100	21700	26500	29000	14300	15500	13900	19300	14500
19	83300	31700	33900	23000	21900	26600	28100	14500	17100	17500	19500	15400
20	78700	34800	33800	22900	20900	27700	25100	15700	17400	21400	18700	15500
21	75600	37100	33600	21200	20500	27800	25200	15700	16400	20300	16800	16900
22	72000	36800	33500	20600	20400	27000	28100	18600	15400	19600	15300	18300
23	69400	36200	31900	18000	20400	25200	28600	20200	15700	18500	14500	18500
24	68600	35800	32200	15800	20800	24300	28600	21600	15500	21600	13500	17700
25	66000	35000	32300	15700	20700	27700	25600	23300	15500	29400	13400	16000
26	61200	34800	31800	15900	21600	30500	21900	25600	14900	32100	13200	15500
27	58300	35200	30700	16600	23200	33400	22400	27900	15200	34300	14100	15200
28	55700	35900	30400	18700	24900	34800	25200	28300	15200	36800	16300	14800
29	54100	36800	30600	21200	---	35600	24200	28700	16200	39200	16300	14200
30	53800	36700	30200	23200	---	37200	23000	29400	16900	38800	16800	14100
31	52000	---	28100	23100	---	38300	---	30500	---	37500	16800	---
TOTAL	2664600	1198500	973500	720600	620500	865900	885200	642900	652300	638000	592300	434700
MEAN	85950	39950	31420	23250	22160	27930	29510	20740	21740	20580	19110	14490
MAX	134000	50200	36100	28800	24900	38300	38500	30500	31900	39200	35300	18500
MIN	52000	31700	22900	15700	20400	20500	21900	12800	14900	12700	13200	12100
AC-FT	5285000	2377000	1932000	1429000	1231000	1718000	1756000	1275000	1294000	1265000	1175000	862200
CFSM	1.45	.67	.53	.39	.37	.47	.50	.35	.37	.35	.32	.24
IN.	1.67	.75	.61	.45	39	.54	.56	.40	.41	.40	.37	.27

CAL YR 1986 TOTAL 21519400 MEAN 58960 MAX 166000 MIN 18200 AC-FT 42680000 CFSM 1.00 IN. 13.52
WTR YR 1987 TOTAL 10889400 MEAN 29830 MAX 134000 MIN 12100 AC-FT 21600000 CFSM .50 IN. 6.84

05378500 MISSISSIPPI RIVER AT WINONA, MN--Continued

WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1963 to current year.

PERIOD OF DAILY RECORD.--
CHEMICAL DATA: April 1963 to August 1986 (discontinued).
SPECIFIC CONDUCTANCE: May 1980 to September 1984 (discontinued).
WATER TEMPERATURES: October 1975 to current year.
SUSPENDED-SEDIMENT DISCHARGE: September 1975 to current year.

REMARKS.--Daily sediment concentrations and loads were estimated on the basis of water records and sediment samples that were collected weekly from October 5 to December 4 and April 1 to September 30. Water temperature was measured at the time of sample collection.

EXTREMES FOR PERIOD OF DAILY RECORD.--
SPECIFIC CONDUCTANCE: Maximum daily, 550 microsiemens, July 17, 1984; minimum daily, 180 microsiemens, Sept. 24, 1980, May 9, 1981.
WATER TEMPERTURES: Maximum daily, 29.0°C, July 10, 1976; minimum daily, 0.0°C on many days each year.
SEDIMENT CONCENTRATIONS: Maximum daily mean, 393 mg/L, July 2, 1978; minimum daily mean, 1 mg/L many days during several years.
SEDIMENT LOADS: Maximum daily, 65,300 tons, July 2, 1978; minimum daily, 19 tons, Dec. 12, 1980.

EXTREMES FOR CURRENT YEAR.--
WATER TEMPERATURES: Maximum daily observed, 26.5°C, July 21; minimum daily, 0.0°C on many days during winter period.
SEDIMENT CONCENTRATIONS: Maximum daily mean, 35 mg/L, July 30; minimum daily mean, 5 mg/L, Jan. 11, 12, 24, 25.
SEDIMENT LOADS: Maximum daily, 9,410 tons, Oct. 1; minimum daily, 212 tons, Jan. 25.

WATER TEMPERATURE, DEGREES CENTIGRADE, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987
INSTANTANEOUS VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	---	---	---	---	---	---	---	---	---	---	---	19.0
2	---	7.0	4.0	---	---	---	---	---	23.0	---	---	---
3	---	---	---	---	---	---	---	---	21.0	---	---	---
4	---	---	---	---	---	---	---	---	---	---	26.0	---
5	9.0	---	---	1.0	---	---	---	15.5	---	---	---	---
6	---	---	---	---	---	---	---	---	---	---	---	---
7	---	---	---	---	---	---	---	---	---	24.5	---	---
8	---	---	---	---	---	---	---	---	---	---	---	22.0
9	---	4.0	---	---	---	---	---	---	24.0	---	---	22.5
10	---	---	---	---	---	---	---	---	---	---	---	---
11	---	---	---	---	---	---	---	---	---	---	24.9	---
12	---	---	---	---	---	---	12.5	19.0	---	---	---	---
13	---	---	---	---	---	---	---	---	---	---	---	---
14	10.0	---	---	---	---	---	10.5	---	---	23.5	---	---
15	---	---	---	---	---	---	---	---	---	---	---	18.0
16	---	3.0	---	---	---	---	---	---	25.0	---	---	---
17	---	---	---	---	---	---	---	---	---	---	---	---
18	---	---	---	---	---	---	---	---	---	---	22.0	---
19	10.0	---	---	---	---	---	---	18.0	---	---	---	---
20	---	---	---	---	---	---	16.0	---	---	---	---	---
21	---	---	---	---	---	---	---	---	---	26.5	---	---
22	---	---	---	---	---	---	---	---	---	---	---	17.0
23	---	.0	---	---	3.0	---	---	---	25.5	---	---	---
24	---	---	---	---	---	---	---	---	---	---	---	---
25	---	1.5	---	---	---	---	---	---	---	---	22.5	---
26	10.0	---	---	---	---	---	---	17.0	---	---	---	---
27	---	---	---	---	---	---	---	---	---	---	---	---
28	---	---	---	---	---	---	13.0	---	---	26.0	---	---
29	---	---	---	---	---	---	---	---	---	26.0	---	16.5
30	---	---	---	---	---	---	---	---	25.0	---	---	---
31	---	---	---	---	---	---	---	---	---	---	---	---
MEAN	---	---	---	---	---	---	---	---	---	---	---	---
MAX	---	---	---	---	---	---	---	---	---	---	---	---
MIN	---	---	---	---	---	---	---	---	---	---	---	---

05378500 MISSISSIPPI RIVER AT WINONA, MN -Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

SEDIMENT, SUSPENDED CONCENTRATION (MG/L), WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DAY	MEAN CONCENTRATION (MG/L)	LOAD (TONS/DAY)	MEAN CONCENTRATION (MG/L)	LOAD (TONS/DAY)	MEAN CONCENTRATION (MG/L)	LOAD (TONS/DAY)	MEAN CONCENTRATION (MG/L)	LOAD (TONS/DAY)	MEAN CONCENTRATION (MG/L)	LOAD (TONS/DAY)	MEAN CONCENTRATION (MG/L)	LOAD (TONS/DAY)
	OCTOBER		NOVEMBER		DECEMBER		JANUARY		FEBRUARY		MARCH	
1	26	9410	15	2170	16	1560	6	452	9	564	12	807
2	25	8910	15	2020	16	1560	6	454	9	569	11	713
3	24	8290	17	2180	16	1540	6	452	9	573	10	610
4	23	7580	17	2120	15	1440	6	433	10	634	8	454
5	23	7200	17	2120	15	1410	6	431	10	621	8	443
6	23	6710	17	2110	14	1270	6	442	11	695	7	391
7	23	6330	17	2060	14	1240	7	544	11	680	9	549
8	23	5950	17	2000	14	1190	7	539	11	668	10	664
9	23	5690	18	2050	14	1150	6	431	12	735	10	683
10	23	5350	19	2190	15	1220	6	405	12	719	13	1010
11	24	5340	20	2400	15	1110	5	327	12	716	14	1190
12	24	5330	20	2430	14	866	5	317	12	697	14	1230
13	24	5270	19	2270	13	828	6	384	12	687	12	998
14	24	5440	19	2070	13	930	6	389	13	776	11	870
15	24	5840	19	1920	14	1040	6	431	13	779	9	697
16	23	5870	18	1740	15	1230	7	438	13	776	8	607
17	23	5900	17	1540	14	1180	7	437	14	828	8	592
18	22	5380	17	1460	14	1300	6	374	14	820	9	644
19	22	4950	17	1460	14	1280	6	373	15	887	9	646
20	21	4460	17	1600	13	1190	6	371	15	846	10	748
21	21	4290	16	1600	12	1090	6	343	15	830	11	826
22	21	4080	15	1490	12	1090	6	334	15	826	11	802
23	20	3750	14	1370	11	947	6	292	15	826	10	680
24	20	3700	14	1350	11	956	5	213	15	842	8	525
25	20	3560	14	1320	11	959	5	212	16	894	9	673
26	20	3300	14	1320	10	859	6	258	15	875	12	988
27	19	2990	15	1430	9	746	6	269	14	877	14	1260
28	18	2710	16	1550	8	657	7	353	13	874	13	1220
29	17	2480	16	1590	8	661	7	401	---	---	14	1350
30	16	2320	16	1590	7	571	8	501	---	---	19	1910
31	16	2250	---	---	7	531	8	499	---	---	19	1960
TOTAL	---	160630	---	54520	---	33601	---	12099	---	21114	---	26740

DAY	MEAN CONCENTRATION (MG/L)	LOAD (TONS/DAY)	MEAN CONCENTRATION (MG/L)	LOAD (TONS/DAY)	MEAN CONCENTRATION (MG/L)	LOAD (TONS/DAY)	MEAN CONCENTRATION (MG/L)	LOAD (TONS/DAY)	MEAN CONCENTRATION (MG/L)	LOAD (TONS/DAY)	MEAN CONCENTRATION (MG/L)	LOAD (TONS/DAY)
	APRIL		MAY		JUNE		JULY		AUGUST		SEPTEMBER	
1	20	2080	9	518	17	1410	12	528	27	2570	9	333
2	20	2070	12	677	18	1540	11	416	22	1880	10	351
3	21	2140	14	805	20	1720	8	302	17	1210	12	418
4	20	1970	16	929	20	1720	10	386	14	934	12	424
5	20	1910	15	846	21	1800	11	380	13	793	11	359
6	21	1950	15	830	21	1780	12	428	12	642	10	359
7	20	1730	15	834	20	1670	15	579	12	583	10	364
8	19	1660	14	779	18	1430	15	672	13	604	10	383
9	19	1600	13	713	16	1130	14	673	13	635	11	431
10	19	1530	10	499	16	1050	13	611	13	779	11	401
11	19	1480	9	367	16	1000	12	551	13	797	10	340
12	19	1470	9	311	15	931	11	508	12	674	9	299
13	16	1240	11	434	15	936	11	508	11	564	9	316
14	11	861	14	726	15	915	11	448	10	454	9	330
15	11	885	13	779	14	782	10	381	9	386	9	347
16	10	788	12	677	14	677	10	359	9	433	20	767
17	11	861	12	564	14	567	9	309	9	459	20	772
18	11	861	11	425	15	628	9	338	11	573	19	744
19	12	910	10	391	16	739	11	520	15	790	17	707
20	11	745	10	424	15	705	12	693	16	808	15	628
21	9	612	10	424	13	576	12	658	16	726	13	593
22	11	835	11	552	11	457	12	635	12	496	12	593
23	12	927	11	600	11	466	13	649	11	431	12	599
24	11	849	11	642	12	502	15	875	10	364	13	621
25	11	760	11	692	11	460	18	1430	11	398	11	475
26	11	650	12	829	11	443	19	1650	11	392	10	418
27	11	665	12	904	9	369	22	2040	10	381	10	410
28	11	748	13	993	9	369	27	2680	11	484	11	440
29	12	784	14	1080	11	481	34	3600	11	484	10	383
30	10	621	15	1190	12	548	35	3670	12	544	10	381
31	---	---	16	1320	---	---	30	3040	11	499	---	---
TOTAL	---	36242	---	21754	---	27801	---	30517	---	21767	---	13986
YEAR		460771										

ROOT RIVER BASIN

05384000 ROOT RIVER NEAR LANESBORO, MN

LOCATION.--Lat 43°44'58", long 91°58'43", in sec.1, T.103 N., R.10 W., Fillmore County, Hydrologic Unit 07040008, on left bank 0.5 mi upstream from highway bridge, 1.2 mi upstream from South Branch, and 2.5 mi northeast of Lanesboro.

DRAINAGE AREA.--615 mi^2.

PERIOD OF RECORD.--February to November 1910, February 1911 to September 1914, July 1915 to September 1917, August 1940 to September 1985, October 1986 to present. Published as North Branch Root River near Lanesboro, 1910-17. High-flow partial-record station, October 1985 to September 1986.

REVISED RECORDS.--WSP 355: 1912. WSP 1308: 1911(M).

GAGE.--Water-stage recorder. Datum of gage is 791.32 ft above National Geodetic Vertical Datum of 1929. Prior to Oct. 1, 1917, nonrecording gage at site 0.5 mi downstream at datum about 1.5 ft higher.

REMARKS.--Records good except those for Dec. 11-30, which are fair.

AVERAGE DISCHARGE.--51 years (water years 1912-14, 1916-17, 1941-85, 1987), 357 ft^3/s, 7.88 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 22,100 ft^3/s, Mar. 29, 1962, gage height, 16.11 ft; maximum gage height, 17.83 ft, Mar. 1, 1965, from floodmark (backwater from ice); minimum discharge, 29 ft^3/s, Aug. 27, 1949, gage height, 1.08 ft; minimum gage height, 0.42 ft, Dec. 3, 1980.

EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 3,500 ft^3/s and maximum (*):

Date	Time	Discharge (ft^3/s)	Gage height (ft)	Date	Time	Discharge (ft^3/s)	Gage height (ft)
Oct. 13	0200	*8,180	*10.85				

No other peak greater than base discharge.

Minimum discharge, 96 ft^3/s, Jan. 17, gage height, 0.68 ft.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1140	593	378	281	260	278	390	266	232	182	260	179
2	1020	583	388	279	262	265	385	274	230	178	222	173
3	1270	566	389	270	261	255	378	273	219	174	246	169
4	2410	553	380	276	275	250	365	260	208	168	353	165
5	2340	536	332	277	262	281	353	251	204	167	268	162
6	1700	528	384	278	260	546	346	246	198	173	244	211
7	1370	515	366	276	260	691	339	242	193	223	226	199
8	1200	524	348	272	325	631	331	236	192	214	215	187
9	1060	524	357	262	353	519	326	234	185	218	217	176
10	953	491	275	268	358	430	321	233	183	200	222	176
11	1070	455	e295	267	331	381	316	242	190	195	204	177
12	5610	455	e345	268	331	355	313	232	193	237	197	174
13	5290	378	e350	268	324	338	305	224	188	240	200	181
14	2420	388	e345	266	318	345	309	239	184	216	205	179
15	1820	479	e340	257	279	345	313	237	179	236	210	176
16	1520	463	e338	161	272	333	314	223	174	309	227	178
17	1310	463	e335	216	283	317	307	217	188	267	237	179
18	1170	435	e330	277	267	313	298	214	262	223	216	178
19	1060	406	e327	235	266	323	290	216	264	229	208	180
20	987	428	e323	238	262	324	280	219	257	250	200	187
21	929	428	e320	253	260	324	278	223	270	236	193	188
22	870	409	e315	244	265	323	283	216	244	209	187	187
23	836	409	e311	142	262	328	310	204	221	192	181	186
24	802	388	e308	191	258	341	316	203	210	580	176	184
25	752	399	e304	277	256	370	305	211	209	499	177	183
26	720	394	e302	291	256	424	295	228	205	359	177	178
27	694	385	e300	278	261	474	285	231	195	298	179	175
28	663	390	e298	280	263	453	276	231	191	264	184	172
29	632	384	e295	277	---	437	273	223	200	242	217	168
30	598	381	e292	268	---	413	267	248	192	231	209	163
31	588	---	286	284	---	392	---	243	---	284	189	---
TOTAL	44804	13730	10256	7977	7890	11799	9467	7239	6260	7693	6646	5370
MEAN	1445	458	331	257	282	381	316	234	209	248	214	179
MAX	5610	593	389	291	358	691	390	274	270	580	353	211
MIN	588	378	275	142	256	250	267	203	174	167	176	162
AC-FT	88870	27230	20340	15820	15650	23400	18780	14360	12420	15260	13180	10650
CFSM	2.35	.74	.54	.42	.46	.62	.51	.38	.34	.40	.35	.29
IN.	2.71	.83	.62	.48	.48	.71	.57	.44	.38	.47	.40	.32

WTR YR 1987 TOTAL 139131 MEAN 381 MAX 5610 MIN 142 AC-FT 276000 CFSM .62 IN. 8.42

e Estimated

05457000 CEDAR RIVER NEAR AUSTIN, MN

LOCATION.--Lat 43°38'11", long 92°58'26", in NE¼SE¼ sec.15, T.102 N., R.18 W., Mower County, Hydrologic Unit 07080201, on left bank 200 ft upstream from abandoned powerhouse, 500 ft downstream from highway bridge, 1.1 mi downstream from Turtle Creek, and 1.1 mi south of Austin.

DRAINAGE AREA.--425 mi^2.

PERIOD OF RECORD.--May 1909 to September 1914, October 1944 to current year.

REVISED RECORDS.--WSP 1145: 1945, 1948.

GAGE.--Water-stage recorder. Datum of gage is 1,162.10 ft above National Geodetic Vertical Datum of 1929. May 1909 to April 1912, nonrecording gage in tailwater of powerplant 200 ft downstream at datum 3.1 ft lower. May 1912 to September 1914, nonrecording gage on highway bridge 500 ft downstream at datum 1.1 ft lower.

REMARKS.--Records good.

AVERAGE DISCHARGE.--48 years (water years 1910-14, 1945-87), 210 ft^3/s, 6.71 in/yr; median of yearly mean discharges, 196 ft^3/s, 6.26 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 12,400 ft^3/s, July 17, 1978, gage height, 20.35 ft, from floodmark in well; no flow for several days in 1911.

EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 1,400 ft^3/s and maximum (*):

Date	Time	Discharge (ft^3/s)	Gage height (ft)	Date	Time	Discharge (ft^3/s)	Gage height (ft)
Oct. 12	1830	*4,070	*10.63	No other peak greater than base discharge.			

Minimum discharge, 55 ft^3/s, July 4, 5, gage height, 2.32 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	405	281	193	109	85	103	203	107	95	72	87	89
2	356	266	208	110	96	96	185	110	95	68	78	83
3	821	262	207	107	103	101	169	116	99	67	110	77
4	1310	259	171	105	103	105	162	105	92	58	104	74
5	1280	248	e170	106	96	123	154	101	89	60	99	74
6	938	242	e173	110	96	152	151	99	84	60	86	81
7	669	234	179	111	106	179	149	95	78	60	78	108
8	536	254	175	108	130	183	146	93	83	95	85	108
9	444	244	167	100	127	158	144	90	76	157	110	93
10	383	219	134	104	122	131	143	86	73	218	102	86
11	784	204	e130	102	116	130	137	109	81	162	96	84
12	3640	212	e128	108	117	123	135	92	81	240	95	80
13	3380	201	e127	106	115	120	133	86	73	463	91	94
14	1850	200	e129	109	115	126	141	99	68	298	87	90
15	1220	197	133	97	95	120	146	91	65	201	83	91
16	912	193	136	100	98	115	143	86	63	169	127	98
17	732	191	137	98	98	113	138	83	75	159	129	96
18	618	188	136	93	94	121	130	97	74	124	124	95
19	539	177	134	93	93	127	119	97	87	126	102	111
20	493	184	129	89	93	129	122	136	136	107	90	114
21	455	181	122	88	92	129	117	180	163	97	232	131
22	422	184	119	84	92	133	134	168	119	89	171	133
23	402	182	123	e80	89	185	151	130	97	80	139	124
24	381	171	122	e77	90	201	142	115	173	162	110	116
25	357	185	119	e75	91	243	133	111	178	216	99	107
26	340	186	118	e75	92	276	128	124	127	135	98	100
27	324	182	114	e76	96	270	127	121	99	149	94	94
28	309	187	114	79	96	250	117	115	86	136	129	94
29	291	187	117	81	---	228	117	111	87	149	118	91
30	273	187	116	82	---	209	111	109	80	120	112	87
31	277	---	113	81	---	207	---	100	---	100	98	---
TOTAL	25141	6288	4393	2943	2836	4887	4227	3362	2876	4457	3363	2903
MEAN	811	210	142	94.9	101	158	141	108	95.9	144	108	96.8
MAX	3640	281	208	111	130	276	203	180	178	463	232	133
MIN	273	171	113	75	85	96	111	83	63	58	78	74
AC-FT	49870	12470	8710	5840	5630	9690	8380	6670	5700	8840	6670	5760
CFSM	1.91	.49	.33	.22	.24	.37	.33	.26	.23	.34	.26	.23
IN.	2.20	.55	.38	.26	.25	.43	.37	.29	.25	.39	.29	.25

CAL YR 1986 TOTAL 149299 MEAN 409 MAX [illegible]0 MIN 60 AC-FT 296100 CFSM .96 IN. 13.07
WTR YR 1987 TOTAL 67676 MEAN 185 MAX [illegible]40 MIN 58 AC-FT 134200 CFSM .44 IN. 5.92

e Estimated

DES MOINES RIVER BASIN

05476000 DES MOINES RIVER AT JACKSON, MN

LOCATION.--Lat 43°37'10", long 94°59'10", in SE¼SW¼ sec.24, T.102 N., R.35 W., Jackson County, Hydrologic Unit 07100001, on right bank in storage room of city powerplant in Jackson.

DRAINAGE AREA.--1,220 mi^2, approximately.

PERIOD OF RECORD.--May 1909 to December 1913, August 1930 to current year (winter record incomplete prior to 1936). Published as Des Moines River near Jackson, 1930-35, as West Fork Des Moines River near Jackson, 1936-44, and as West Fork Des Moines River at Jackson, 1945-69.

REVISED RECORDS.--WSP 1115: 1942. WSP 1175: Drainage area. WSP 1238: 1950. WSP 1308: 1938(M).

GAGE.--Water-stage recorder. Datum of gage is 1,287.75 ft above National Geodetic Vertical Datum of 1929. May 31, 1909, to Dec. 20, 1913, nonrecording gage at site 0.6 mi downstream at datum 0.99 ft lower. Aug. 22, 1930, to Sept. 30, 1944, nonrecording gage at site 7 mi upstream at datum 17.10 ft higher. Oct. 1, 1944, to Oct. 26, 1949, nonrecording gage at site 600 ft upstream at datum 10.64 ft higher. Oct. 27, 1949, to Dec. 15, 1965, water-stage recorder 200 ft downstream at present datum.

REMARKS.--Records good except those for estimated daily discharges, which are fair. Regulation at times by Yankton, Long, Shetek, and Heron Lakes.

AVERAGE DISCHARGE.--52 years (water years 1936-87), 332 ft^3/s, 3.70 in/yr; median of yearly mean discharges, 246 ft^3/s, 2.74 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 15,700 ft^3/s, Apr. 11, 1969, gage height, 19.45 ft; no flow at times.

EXTREMES FOR CURRENT YEAR.--Peak discharge above base of 900 ft^3/s (revised) and maximum (*):

Date	Time	Discharge (ft^3/s)	Gage height (ft)	Date	Time	Discharge (ft^3/s)	Gage height (ft)
Oct. 1	0015	4,350	13.60	July 18	2115	1,010	6.77
(occurred on recession following peak of Sept. 28, 1986)							
Apr. 1	2100	*2,050	*9.82				
(maximum independent peak)							

Minimum discharge, 30 ft^3/s, Sept. 30, gage height, 3.00 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	4140	833	e575	e216	120	165	1970	602	480	85	221	54
2	3600	780	e560	e210	121	170	1930	593	458	78	195	54
3	3240	768	e555	e202	122	178	1750	554	421	73	192	49
4	3100	738	e430	e206	122	160	1660	527	381	64	160	46
5	e2830	707	e340	e210	e124	181	1610	520	349	82	145	50
6	2510	703	e350	e215	e126	189	1540	506	323	236	131	54
7	2400	697	e362	e212	e128	209	1480	481	299	245	127	51
8	2240	708	e370	e210	e130	230	1440	455	269	312	118	49
9	2120	761	e335	e203	e132	230	1390	428	233	381	119	48
10	e1900	628	e312	e195	136	204	1340	408	229	424	114	55
11	1840	e450	e290	e188	148	210	1310	384	233	436	105	56
12	1760	e445	e272	e189	173	241	1280	338	239	466	107	53
13	1640	e394	e263	e200	e172	223	1250	323	216	522	101	60
14	1550	e550	e252	e210	e168	224	1220	338	210	610	89	75
15	1500	e645	e253	e210	e154	230	1180	294	228	745	85	53
16	1450	e630	e262	e200	e140	231	1160	275	233	868	88	50
17	e1350	e610	e242	e180	e144	221	1140	269	224	911	87	49
18	e1270	e600	e232	e170	e148	249	1100	248	209	922	80	46
19	e1220	e560	e276	e160	e154	276	1050	226	185	896	75	43
20	1180	e520	e220	e150	e145	286	1020	226	193	815	70	48
21	1110	e515	e218	e145	e150	305	963	269	198	750	69	49
22	1060	e510	e210	e137	e150	369	904	289	178	678	67	47
23	e1040	e530	e209	e132	e155	698	901	276	174	604	66	48
24	1010	e570	e210	e130	150	1140	867	263	165	550	63	44
25	e990	e590	e211	e128	154	1400	831	327	177	479	66	41
26	e960	e580	e180	e121	157	1570	792	449	158	442	64	41
27	930	e590	e163	e121	157	1700	755	508	135	403	66	40
28	917	e600	e174	e120	157	1760	707	513	116	363	72	36
29	887	e600	e190	118	---	1760	688	507	108	324	71	35
30	854	e590	e215	121	---	1660	637	502	97	283	63	31
31	844	---	e225	124	---	1720	---	507	---	250	60	---
TOTAL	53442	18402	8306	5333	4037	18389	35865	12407	7110	14297	3136	1455
MEAN	1724	613	287	172	144	593	1195	400	237	461	101	48.5
MAX	4140	833	575	216	173	1760	1970	602	480	922	221	75
MIN	844	394	163	118	120	160	637	226	97	64	60	31
AC-FT	106000	36500	17670	10580	8010	36470	71140	24610	14120	28360	6220	2890
CFSM	1.41	.50	.24	.14	.12	.49	.98	.33	.19	.38	.08	04
IN.	1.63	.56	.27	.16	.12	.56	1.09	.38	.22	.44	.10	.04

CAL YR 1986 TOTAL 391313 MEAN 1072 MAX 4970 MIN 61 AC-FT 776200 CFSM .88 IN. 11.93
WTR YR 1987 TOTAL 182787 MEAN 501 MAX 4140 MIN 31 AC-FT 362600 CFSM .41 IN. 5.57

e Estimated

DISCHARGE AT PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

As the number of streams on which streamflow information is likely to be desired far exceeds the number of stream-gaging stations feasible to operate at one time, the Geological Survey collects limited streamflow data at sites other than stream-gaging stations. When limited streamflow data are collected on a systematic basis over a period of years for use in hydrologic analyses, the site at which the data are collected is called a partial-record station. Data collected at these partial-record stations are usable in low-flow or flood-flow analyses, depending on the type of data collected. In addition, discharge measurements are made at other sites not included in the partial-record program. These measurements are generally made in times of drought or flood to give better areal coverage to those events. Those measurements and others collected for some special reason are called measurements at miscellaneous sites.

Records collected at partial-record stations are presented in two tables. The first is a table of discharge measurements at low-flow partial-record stations and the second is a table of annual maximum stage and discharge at crest-stage stations. Discharge measurements made at miscellaneous sites for both low flow and high flow are given in a third table.

Low-flow partial-record stations

Measurements of streamflow in the area covered by this report made at low-flow partial-record stations are given in the following table. These measurements were made during periods of base flow when streamflow is primarily from ground-water storage. These measurements, when correlated with the simultaneous discharge of a nearby stream when continuous records are available, will give a picture of the low-flow potentiality of a stream. The column headed "Period of record" shows the water years in which measurements were made at the same, or practically the same site.

Discharge measurements made at low-flow partial-record stations during water year 1987

Station No.	Station name	Location	Drainage area (mi^2)	Period of record	Measurements Date	Measurements Discharge (ft^3/s)
		Mississippi River basin				
05200010	Mississippi River at Lake Itasca, MN	Lat 47°14'35", long 95°12'38", in NW¼SW¼ sec.35, T.144 N., R.36 W., Clearwater County, Hydrologic Unit 07010101, at first culvert downstream from Lake Itasca, at County Highway 38 in Itasca State Park, 1 mile south of town of Lake Itasca, about 22 miles southwest of Bemidji.	a38.6	1964-65, 1967, 1970-71, 1973-74, 1976, 1987	6-16-87	13
		Schoolcraft River Basin				
05200450	Schoolcraft River near Bemidji, MN.	Lat 47°24'48", long 94°54'46", in SW¼SE¼ sec.31, T.146 N., R.33 W., Beltrami County, Hydrologic Unit 07010101, at bridge on County Highway 2, 0.1 mile downstream from Lake Plantagenet outlet, 4.6 miles south of Bemidji.	a165	1947, 1964-65, 1970-71, 1973-76, 1987	6-17-87	98
		Turtle River Basin				
05200850	Turtle River near Pennington, MN	Lat 47°32'34", long 94°35'52", in SE¼SW¼ sec.15, T.147 N., R.31 W., Beltrami County, Hydrologic Unit 07010101, at bridge on County Highway 20, 7 miles northwest of Pennington.	a165	1964-65, 1970-71, 1973-76, 1987	6-16-87	40
05200920	North Turtle River near Pennington, MN	Lat 47°32'29", long 94°34'02", in NE¼NE¼ sec.23, T.147 N., R.31 W., Beltrami County, Hydrologic Unit 07010101, at bridge on County Highway 20, 0.5 mile upstream from mouth, 5.8 miles northwest of Pennington.	a76.5	1964-65, 1970-71, 1973-76, 1987	6-16-87	47
		Leech Lake River Basin				
05204400	Boy River at Longville, MN	Lat 46°59'00", long 94°12'33", in NW¼SE¼ sec.34, T.141 N., R.28 W., Cass County County, Hydrologic Unit 07010102, at bridge on State Highway 84, at Girl Lake outlet at Longville.	a160	1953-54, 1964-65, 1970-71, 1973, 1975-76, 1987	6-17-87	46

DISCHARGE AT PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

Discharge measurements made at low-flow partial-record stations during water year 1987.--Continued

Station No.	Station name	Location	Drainage area (mi^2)	Period of record	Measurements	
					Date	Discharge (ft^3/s)
		Leech Lake River Basin.--Continued				
05205200	Boy River near Remer, MN	Lat 47°04'51", long 94°05'54", in SE¼SE¼ sec.28, T.142 N., R.27 W., Cass County, Hydrologic Unit 07010102, at bridge on County Highway 53, 1.5 miles upstream from Boy Lake, about 9 miles northwest of Remer.	a310	1964-65, 1970-71, 1973 1975-76, 1987+	6-17-87	105
		Prairie River Basin				
05212200	Prairie River near Nashwauk, MN	Lat 47°29'37", long 93°19'14", in NW¼SW¼ sec.19, T.58 N., R.23 W., Itasca County, Hydrologic Unit 07010103, at bridge on County Highway 336, about 10 miles northwest of Nashwauk.	a220	1964-65, 1970-71, 1973, 1975-76, 1987	6-16-87	42
05212700	Prairie River near Taconite, MN	Lat 47°23'20", long 93°22'50", in NW¼SW¼ sec.27, T.57 N., R.24 W., Itasca County, Hydrologic Unit 07010103, on left bank upstream of highway bridge, 1.5 miles downstream from outlet of Lawrence Lake, 5 miles north of Taconite.	-	1976-83#, 1987	6-16-87	134
		Willow River Basin				
05220670	Willow River near Hill City, MN	Lat 46°54'00", long 93°36'50", on line between secs.14, and 15, T.51 N., R.26 W., Aitkin County, Hydrologic Unit 07010103, at bridge on on U.S. Highway 169, 6 miles south of intersection of State Highway 200 with U.S. Highway 169 at south edge of Hill City.	a160	1964-65, 1970-71, 1973-76, 1987	6-18-67	78
		Moose River Basin				
05220673	Moose River near Hill City, MN	Lat 46°53'19", long 93°35'34", in SE¼SE¼ sec.23, T.51 N., R.26 W., Aitkin County, Hydrologic Unit 07010103, on township road, 7.5 miles south of Hill City, 1 mile east of U.S. Highway 169.	-	1984, 1987	6-18-87	9.22
		Ripple River Basin				
05227480	Ripple River at Aitkin, MN	Lat 46°31'47", long 93°42'26", in NE¼NE¼ sec.26, T.47 N., R.27 W., Aitkin County, Hydrologic Unit 07010104, at bridge on U.S. Highway 169, 0.2 mile south of intersection of U.S. Highway 169 with State Highway 210 in Aitkin, 0.8 mile upstream from mouth.	a125	1964-65, 1970-71, 1973, 1975-76, 1987	6-18-87	19
		Pine River Basin				
05229500	Pine River near Jenkins, MN	Lat 46°41'37", long 94°18'14", in NE¼SE¼ sec.11, T.137 N., R.29 W., Crow Wing County, Hydrologic Unit 07010105, at bridge on County Highway 15, 0.8 mile upstream from Upper Whitefish Lake, 3.5 miles northeast of Jenkins.	a285	1964-65, 1970-71, 1973, 1975-76, 1987+	6-17-87	93
05235500	Little Pine River near Cross Lake, MN	Lat 46°37'48", long 93°59'04", in SW¼SW¼ sec.33, T.137 N., R.26 W., Crow Wing County, Hydrologic Unit 07010105, at bridge on county road, 5 miles upstream from mouth, 6 miles southeast of town of Cross Lake, about 10 miles north of Crosby.	a195	1964-65, 1970-71, 1973, 1975-76, 1987	6-17-87	45

DISCHARGE AT PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

Discharge measurements made at low-flow partial-record stations during water year 1987.--Continued

Station No.	Station name	Location	Drainage area (mi^2)	Period of record	Measurements	
					Date	Discharge (ft^3/s)
		Rabbit River Basin				
05241500	Rabbit River near Crosby, MN	Lat 46°30'55", long 93°57'35", in SE¼NE¼ sec.35, T.47 N., R.29 W., Crow Wing County, Hydrologic Unit 07010104, at bridge on State Highway 6, 0.3 mile downstream of Clinker Lake, 2 miles north of Crosby.	8.38	1943, 1945-63#, 1965	6-17-87	3.04
		Nokasippi River Basin				
05261520	Nokasippi River below Fort Ripley, MN	Lat 46°12'02", long 94°19'03", on line between secs.13 and 24, T.43 N., R.32 W., Crow Wing County, Hydrologic Unit 07010104, at bridge on County Highway 2, 3 miles northeast of Fort Ripley.	178	1968-70, 1975-76, 1987+	5- 7-87 6-18-87	53 31
		Two Rivers River Basin				
05267400	Two Rivers near Bowlus, MN	Lat 45°49'19", long 94°21'45", in SW¼SW¼ sec.8, T.127 N., R.29 W., Morrison County, Hydrologic Unit 07010201, at bridge on County Highway 25, 0.5 mile upstream from mouth, 2 miles east of Bowlus.	158	1968-70, 1975, 1987	6-22-87* 7-27-87* +#	8.16 20
		Watab River Basin				
05269800	Watab River near Sartell, MN	Lat 45°37'09", long 94°13'38", in NE¼SE¼ sec.20, T.125 N., R.28 W., Stearns County, Hydrologic Unit 07010201, at bridge on county road, 1.1 miles west of Sartell.	90.1	1969-70, 1974, 1976, 1979, 1987	4-17-87	53
		Sauk River Basin				
05270150	Ashley Creek near Sauk Centre, MN	Lat 45°46'46", long 94°58'52", in NW¼SE¼ sec.29, T.127 N., R.34 W., Todd County, Hydrologic Unit 07010202, at bridge of County Highway 11, 3 miles north of Sauk Centre.	113	1968-70, 1974, 1976, 1987+	5-19-87 8- 5-87	30 19
05270455	Mill Creek at Rockville, MN	Lat 45°28'20", long 94°20'21", on line between secs.9 and 16, T.123 N., R.29 W., Stearns County, Hydrologic Unit 07010202, at bridge on State Highway 23, at Rockville, 0.2 mile upstream from mouth.	51.6	1969-70, 1974, 1976-80, 1987	4-17-87	25
		Clearwater River Basin				
05273100	Three Mile Creek near Fairhaven, MN	Lat 45°21'10", long 94°09'57", in NW¼NE¼ sec.26, T.122 N., R.28 W., Stearns County, Hydrologic Unit 07010203, 2.5 miles northeast of Fairhaven on State Highway 45.	-	1978, 1980, 1987	4-17-87	6.56
		Elk River Basin				
05273990	Mayhew Creek near St. Cloud, MN	Lat 45°35'14", long 94°02'35", in NE¼NW¼ sec.26, T.36 N., R.30 W., Benton County, Hydrologic Unit 07010203, 300 feet upstream from mouth, 500 feet northwest of Elk River bridge on State Highway 95, 6 miles east of St. Cloud.	53.2	1968-70, 1974, 1976, 1987	4-22-87	8.52

DISCHARGE AT PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

Discharge measurements made at low-flow partial-record stations during water year 1987.--Continued

Station No.	Station name	Location	Drainage area (mi^2)	Period of record	Measurements Date	Measurements Discharge (ft^3/s)
		Elk River Basin.--Continued				
05274300	Rice Creek near Clear Lake, MN	Lat 45°29'57", long 93°58'28", in NE¼NW¼ sec.29, T.35 N., R.29 W., Sherburne County, Hydrologic Unit 07010203, at bridge on County Highway 61, 1.0 mile upstream from mouth, 3.8 miles northeast of Clear Lake.	39.6	1969-70 1974, 1976-78 1980, 1987	4-22-87	13
05274350	Briggs Creek near Clear Lake, MN	Lat 45°30'57", long 93°55'29", on line between secs.15 and 33, T.35 N., R.29 W., Sherburne County, Hydrologic Unit 07010203, at County Highway 48, 0.7 mile northeast of Lake Briggs, 5.9 miles northeast of Clear Lake.	-	1970, 1976, 1978, 1980, 1987	4-22-87	8.70
		Crow River Basin				
05278150	Washington Creek near Kingston, MN	Lat 45°09'47", long 94°18'43", in NW¼NW¼ sec.34, T.120 N., R.29 W., Meeker County, Hydrologic Unit 07010204, at bridge on County Highway 4, 2.1 miles south of Kingston.	81.0	1969-71, 1976, 1987	4-24-87	22
05279500	South Fork Crow River near Rockford, MN	Lat 45°03'34", long 93°46'34", in NW¼ sec.1, T.118 N., R.25 W., Wright County, Hydrologic Unit 07010205, at bridge on county road, 2 miles upstream from North Fork Crow River, 3.5 miles southwest of Rockford.	a1250	1909-12# 1970, 1980, 1987	4-24-87	184
		Rum River Basin				
05284810	Green Lake Brook at West Point, MN	Lat 45°33'49", long 93°23'20", in NE¼SE¼ sec.36, T.36 N., R.25 W. Isanti County, Hydrologic Unit 07010207, at bridge on State Highway 47, 0.2 mile upstream from mouth, 0.5 mile north of West Point.	29.7	1965, 1969-70, 1974, 1977, 1979-80 1987	4-16-87	19
05284970	Lower Stanchfield Creek near Grandy, MN	Lat 45°37'50", long 93°13'46", in SW¼SE¼ sec.5, T.36 N., R.23 W., Isanti County, Hydrologic Unit 07010207, at bridge on County Highway 6, at Little Stanchfield Lake, 1.9 miles southwest of Grandy.	40.9	1969-70, 1974, 1976, 1979, 1983, 1987	4-17-87	14
05284985	Bekins Creek near Cambridge, MN	Lat 45°35'34", long 93°13'29", in NW¼SW¼ sec.21, T.36 N., R.23 W., Isanti County, Hydrologic Unit 07010207, at bridge on County Highway 33, 0.8 mile north of Cambridge.	-	1965, 1987	4-24-87	2.00
05285300	Long Lake outlet near Isanti, MN	Lat 45°26'31", long 93°19'14", on line between secs.10 and 15, T.34 N., R.24 W., Isanti County, Hydrologic Unit 07010207, at culvert on county road, 4.5 miles northeast of St. Francis, 5.3 miles southwest of Isanti.	15.4	1965, 1969-70, 1975-76, 1987	4-24-87	4.75
05285800	Seelye Brook near St. Francis, MN	Lat 45°21'58", long 93°22'20", in SW¼NE¼ sec.7, T.33 N., R.24 W., Anoka County, Hydrologic Unit 07010203, at bridge on County Highway 55, 0.9 mile upstream from mouth, 1.6 miles south of St. Francis.	37.5	1965 1969-70, 1974, 1976, 1980, 1987	4-24-87	14

DISCHARGE AT PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

Discharge measurements made at low-flow partial-record stations during water year 1987.--Continued

Station No.	Station name	Location	Drainage area (mi^2)	Period of record	Measurements Date	Measurements Discharge (ft^3/s)
		Rum River Basin.--Continued				
05286800	Trott Brook near Nowthen, MN	Lat 45°17'16", long 93°25'08", in SW¼SE¼ sec.2, T.32 N., R.25 W., Anoka County, Hydrologic Unit 07010207, at bridge on State Highway 47, 0.8 mile upstream from mouth, 3.9 miles southeast of Nowthen.	72.0	1965, 1969-70, 1974-76, 1980, 1987	4-16-87	26
		Minnesota River Basin				
05317300	Morgan Creek at Cambria, MN	Lat 44°14'32", long 94°19'36", in SW¼SW¼ sec.16, T.109 N., R.29 W., Blue Earth County, Hydrologic Unit 07020007, at culvert on State Highway 68, 0.5 mile upstream from mouth, 0.6 mile northwest of Cambria.	59.6	1969-70, 1973, 1980, 1985, 1987	4-15-87	13
05317600	Minneopa Creek near Mankato, MN	Lat 44°09'12", long 94°04'58", in SW¼SW¼ sec.16, T.108 N., R.27 W., Blue Earth County, Hydrologic Unit 07020007, at culvert on State Highway 68, 3 miles west of Mankato.	-	1987	4-15-87 5-12-87	14 2.81
053178102	West Branch Blue Earth River near Elmore, MN	Lat 43°32'36", long 94°06'48", in SW¼SE¼ sec.18, T.101 N., R 27., Faribault County, Hydrologic Unit 07020009, at culvert on township road, 2.8 miles northwest of Elmore, 6 miles south of Blue Earth.	-	1987	4-17-87	129
05317818	Blue Earth River near Blue Earth, MN	Lat 43°34'22", long 94°06'08", in SW¼SW¼ sec.5, T.101 N., R.27 W., Faribault County, Hydrologic Unit 07020009, at bridge on County Highway 4, 4.8 miles south of Blue Earth.	a310	1968-70, 1976, 1987	4-17-87	250
05317830	Coon Creek near Blue Earth, MN	Lat 43°36'57", long 94°05'51", on line between secs.20 and 29, T.102 N., R.27 W., Faribault County, Hydrologic Unit 07020009, at bridge on county road. 0.5 mile upstream from mouth, 1.8 miles south of Blue Earth.	96.6	1969-71, 1976, 1987	4-16-87	54
05317840	Badger Creek near Blue Earth, MN	Lat 43°38'26", long 94°08'16", in SW¼NE¼ sec.13, T.102 N., R.28 W., Faribault County, Hydrologic Unit 07020009, at bridge on county road, 1.2 miles upstream from mouth, 1.2 miles west of Blue Earth.	80.6	1969-71 1976, 1987	4-16-87	54
05318040	Brush Creek near Bricelyn, MN	Lat 43°35'52", long 93°47'41", in SW¼NE¼ sec.35, T.102 N., R.25 W., Faribault County, Hydrologic Unit 07020009, at bridge on county road, 0.4 mile above mouth, 2.25 miles northeast of Bricelyn.	-	1969, 1987	4-17-87	30
05318120	East Branch Blue Earth River at Blue Earth, MN	Lat 43°38'58", long 94°06'10", in NW¼SW¼ sec.8, T.102 N., R.27 W., Faribault County, Hydrologic Unit 07020009, at bridge on U.S. Highway 169 in Blue Earth.	a285	1969-71, 1976, 1987	4-16-87	114
05318140	South Creek near Winnebago, MN	Lat 43°42'33", long 94°10'38", in NW¼SE¼ sec.22, T.103 N., R.28 W., Faribault County, Hydrologic Unit 07020009, at bridge on County Highway 5, 3.5 miles south of Winnebago.	106	1969-70, 1976, 1987	4-16-87	47

Discharge measurements made at low-flow partial-record stations during water year 1987.--Continued

Station No.	Station name	Location	Drainage area (mi^2)	Period of record	Measurements Date	Measurements Discharge (ft^3/s)
		Minnesota River Basin.--Continued				
053181435	Dutch Creek near Fairmont, MN	Lat 44°37'57", long 94°30'44", in SE¼SE¼ sec.14, T.102 N., R.31 W., Martin County, Hydrologic Unit 07020009, at culvert on County Road 37, 3 miles southwest of Fairmont, 2 miles upstream of Hall Lake.	-	1987	4-16-87	7.20
05318160	Lily Creek near Fairmont, MN	Lat 43°40'47", long 94°29'30", in NW¼SW¼ sec.31, T.103 N., R.30 W., Martin County, Hydrologic Unit 07020009, at culvert on Interstate 90, 1.5 miles upstream from mouth, 2.3 miles northwest Fairmont.	41.7	1969-71 1975, 1976, 1980, 1985, 1987	4-16-87	23
053182859	Willow Creek near Vernon Center, MN	Lat 43°55'37", long 94°14'19", in center of sec.6, T.105 N., R.28 W., Blue Earth County, Hydrologic Unit 07020009, at bridge on County Road 146, 5 miles northwest of Amboy, 4.5 miles southwest of Vernon Center.	-	1987	4-15-87	19
05318288	Blue Earth River at Vernon Center, MN	Lat 43°57'22", long 94°10'14", in E½ sec.27, T.106 N., R.28 W., Blue Earth County, Hydrologic Unit 07020009, at bridge on U.S. Highway 169, at south edge of Vernon Center.	-	1969, 1987	4-20-87	766
05318400	Watonwan River near Darfur, MN	Lat 44°01'37", long 94°47'56", on line between secs.33 and 34 T.107 N., R.33 W., Watonwan County, Hydrologic Unit 07020010, at bridge on County Road 5, 2 miles southeast of Darfur.	-	1969, 1987	4-21-87	43
05318550	North Fork Watonwan River near Darfur, MN	Lat 44°04'46", long 94°50'21", at intersection of secs.7, 8, 17, and 18, T.107 N., R.33 W., Watonwan County, Hydrologic Unit 07020010, at bridge on County Road 4, 1.9 miles north of Darfur.	-	1969, 1987	4-21-87	19
05319220	Spring Creek near Lewisville, MN	Lat 43°58'28", long 94°25'45", in SE¼NE¼ sec.21, T.106 N., R.30 W., Watonwan County, Hydrologic Unit 07020010, on State Highway 15 and 30, 3.5 miles north of Lewisville.	-	1969, 1987	4-21-87	4.18
05319350	Perch Creek near Vernon Center, MN	Lat 43°58'33", long 94°17'14", in NW¼NW¼ sec.23, T.106 N., R.29 W., Blue Earth County, Hydrologic Unit 07020010, at culvert on County Road 32, 6 miles west of Vernon Center, 8 miles northeast of Lewisville, 2 miles above mouth.	-	1987	4-15-87	58
05320020	Le Sueur River near New Richland, MN	Lat 43°56'43", long 93°27'21", in SW¼NE¼ sec.34, T.106 N., R.22 W., Waseca County, Hydrologic Unit 07020011, at bridge on County Highway 56, 3.8 miles northeast of New Richland.	75.6	1969, 1971, 1976, 1980, 1987	4-16-87	17
05320040	Boot Creek near New Richland, MN	Lat 43°56'07", long 93°30'52", on line between sec.6, T.105 N., R.22 W., and sec.31, T.106 W., R.22 W., Waseca County, Hydrologic Unit 07020011, at bridge on county road, 0.5 mile upstream from mouth, 2 miles northwest of New Richland.	48.6	1969, 1971, 1976, 1980, 1987	4-16-87	8.11

DISCHARGE AT PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

Discharge measurements made at low-flow partial-record stations during water year 1987.--Continued

Station No.	Station name	Location	Drainage area (mi^2)	Period of record	Measurements	
					Date	Discharge (ft^3/s)
		Minnesota River Basin.--Continued				
05320060	Little Le Sueur River near Wilton, MN	Lat 44°00'06", long 93°30'32", in SE¼NE¼ sec.7, T.106 N., R.22 W., Waseca County, Hydrologic Unit 07020011, at bridge on County Highway 51, 0.3 mile upstream from mouth, 1.5 miles southeast of Wilton.	23.9	1969, 1971, 1976, 1980, 1987	4-16-87	5.36
05320265	Bull Run Creek near Pemberton, MN	Lat 43°59'20", long 93°47'00", in NW¼ sec.13, T.106 N., R.25 W., Blue Earth County, Hydrologic Unit 07020011, at culvert on County Road 53, 1.5 miles south of Pemberton, MN.	-	1987	4-22-87	3.04
05320270	Little Cobb River near Beauford, MN	Lat 43°59'48", long 93°54'32", in SE¼SE¼ sec.11, T.106 N., R.26 W., Blue Earth County, Hydrologic Unit 07020011, at culvert on County Highway 16, 5 miles northeast of Mapleton, 2.5 miles east of Beauford.	-	1987	4-21-87	14
05320360	Maple River near Easton, MN	Lat 43°43'41", long 93°53'39", in center of sec.13, T.104 N., R.26 W., Faribault County, Hydrologic Unit 07020011, at culvert on township road, 1.5 miles southeast of Minnesota Lake, 3 miles north of Easton.	-	1987	4-22-87	10
05320420	Rice Creek near Sterling Center, MN	Lat 43°53'56", long 94°03'43", in SE¼NW¼ sec.15, T.105 N., R.27 W., Blue Earth County, Hydrologic Unit 07020011, 1 mile southeast of Sterling Center 0.5 mile from mouth.	-	1987	4-21-87	17
05325250	Dog Creek near Kasota, MN	Lat 44°17'26", long 93°54'09", in NE¼SW¼ sec.36, T.110 N., R.26 W., LeSueur County, Hydrologic Unit 07020007, on County Road 18, 3 miles east of Kasota, 3.5 miles southeast of St. Peter.	-	1984-87	4-17-87	0.59
05325260	Shanaska Creek at Kasota, MN	Lat 44°17'19", long 93°57'18", in NW¼SE¼ sec.33, T.110 N., R.26 W., LeSueur County, Hydrologic Unit 07020007, on State Highway 22, on east edge of Kasota, 2.5 miles south of St. Peter.	-	1984-85 1987	4-17-87	5.70
05325580	Cherry Creek near Ottawa, MN	Lat 44°21'28", long 93°54'32" in SE¼SE¼ sec.2, T.110 N., R.26 W., LeSueur County, Hydrologic Unit 07020007, at culvert on County Highway 20, 3.3 miles southeast of Ottawa.	-	1969 1984-85, 1987	4-17-87	1.40
b05326100	LeSueur Creek near Ottawa, MN	Lat 44°23'56", long 93°52'04", in SW¼SW¼ sec.20, T.111 N., R.25 W., LeSueur County, Hydrologic Unit 07020012, at county road, 4.1 miles northeast of Ottawa.	-	1969, 1987	4-17-87	7.35
05326400	Rush River near Henderson, MN	Lat 44°29'57", long 93°54'18", in NW¼NW¼ sec.24, T.112 N., R.26 W., Sibley County, Hydrologic Unit 07020012, at bridge on State Highway 93, 0.4 mile upstream from mouth, 2.0 miles south of Henderson.	a397	1970-71, 1979-80, 1984-85, 1987	4-20-87	58

DISCHARGE AT PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

Discharge measurements made at low-flow partial-record stations during water year 1987.--Continued

Station No.	Station name	Location	Drainage area (mi^2)	Period of record	Measurements	
					Date	Discharge (ft^3/s)
		Minnesota River Basin.--Continued				
05326800	Buffalo Creek near New Rome, MN	Lat 44°33'44", long 94°03'06", in NW¼SW¼ sec.26, T.113 N., R.27 W., Sibley County, Hydrologic Unit 07020012, on County Highway 17, 2.4 miles northeast of New Rome.	-	1969, 1985, 1987	4-20-87	1.39
05329900	Bevens Creek at East Union, MN	Lat 44°42'44", long 93°40'59", in SW¼NW¼ sec.2, T.114 N., R.24 W., Carver County, Hydrologic Unit 07020012, at bridge on County Highway 40, 0.4 mile south of East Union 2.3 miles upstream from mouth.	126	1969-70, 1975-76, 1979-80, 1985, 1987	4-20-87	12
05329940	Sand Creek of Jordon, MN	Lat 44°40'20", long 93°38'05", in NE¼NW¼ sec.19, T.114 N., R.23 W., Scott County, Hydrologic Unit 07020012, at bridge on U.S. Highway 169 in Jordan.	a238	1936, 1960, 1966, 1968, 1985, 1987	4-20-87	35
		St. Croix River Basin				
05335170	Crooked Creek near Hinckley, MN	Lat 46°00'42", long 92°31'45", in NE¼NE¼ sec.30, T.41 N., R.17 W., Pine County, Hydrologic Unit 07030001, at bridge on State Highway 48, 2.7 miles upstream from mouth, 8 miles south of Duxbury, 19 miles east of Hinckley.	93.0	1966-70, 1974, 1976, .980, 1987+	3-17-87 5- 5-87	46 30
05340100	North Branch Sunrise River tributary near Weber, MN	Lat 45°30'00", long 93°04'44", in SW¼SW¼ sec.22, T.35 N., R.22 W., Isanti County, Hydrologic Unit 07030005, at culvert on County Highway 5, 0.6 mile upstream from mouth, 2.8 miles northeast of Weber.	12.4	1959-70 1974 1976 1980, 1983, 1987	4-24-87	0.96
05340110	North Branch Sunrise River near Weber, MN	Lat 45°29'59", long 93°03'22", in SE¼SW¼ sec.23, T.35 N., R.22 W., Isanti County, Hydrologic Unit 07030005, at bridge on County Highway 5, 3.8 miles northeast of Weber.	30.7	1969-70 1974, 1976, 1980, 1983, 1987	4-24-87	7.76
05348300	Little Cannon River near Kilkenny, MN	Lat 44°18'20", long 93°36'07", in SW¼NW¼ sec.28, T.110 N., R.23 W., LeSueur County, Hydrologic Unit 07040002, at culvert on County Highway 13, 6 miles north of Waterville, 1.5 miles west of Kilkenny, 1.2 miles upstream of Sabra Lake.	-	1987	4-17-87	1.98
b05349550	Whitewater Creek at Waterville, MN	Lat 44°13'04", long 93°33'48", in NW¼SW¼ sec.26, T.109 N., R.23 W., Le Sueur County, Hydrologic Unit 07040002, at bridge on County Road 14 in Waterville.	-	1987	4-16-87 5-14-87	.02 1.81
b05351400	Devil Creek near Morristown, MN	Lat 44°15'15", long 93°28'04", in SE¼SE¼ sec.9, T.109 N., R.22 W., Rice County, Hydrologic Unit 07040002, 2 miles northwest of Morristown.	-	1965, 1985, 1987	4-16-87	3.26
b05351800	Mackenzie Creek near Warsaw, MN	Lat 44°15'18", long 93°21'24", in SE¼SW¼ sec.9, T.109 N., R.21 W., Rice County, Hydrologic Unit 07040002, at State Highway 60, 2 miles east of Warsaw.	-	1965, 1985, 1987	4-16-87	3.55

DISCHARGE AT PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

Discharge measurements made at low-flow partial-record stations during water year 1987.--Continued

Station No.	Station name	Location	Drainage area (mi²)	Period of record	Measurements	
					Date	Discharge (ft³/s)
		Cannon River Basin				
05354600	Wolf Creek near Dundas, MN	Lat 44°24'38", long 93°13'15", on line between secs.21 and 22, T.111 N., R.20 W., Rice County, Hydrologic Unit 07040002, at bridge on County Highway 8, 0.7 mile upstream from mouth, 1.5 miles southwest of Dundas.	42.1	1969-72, 1974-76, 1979-80, 1983, 1987	4-29-87	1.97
05355020	Heath Creek near Northfield, MN	Lat 44°26'48", long 93°11'15", in NW¼SE¼ sec.2, T.111 N., R.20 W., Rice County, Hydrologic Unit 07040002, at bridge on County Highway 78, 0.2 mile upstream from mouth, 1.5 miles southwest of Northfield.	40.7	1965, 1969-72, 1974-76, 1979-80, 1983, 1987	4-29-87	1.73
05355040	Chub Creek at Randolph, MN	Lat 44°31'23", long 93°01'46", in NE¼NW¼ sec.7, T.112 N., R.18 W., Dakota County, Hydrologic Unit 07040002, at bridge on County Highway 94, at west edge of Randolph	85.1	1969-72, 1974, 1976, 1980, 1987	4-29-87	18
05355060	Spring Creek near Cannon Falls, MN	Lat 44°30'21", long 92°59'40", in NE¼SW¼ sec.16, T.112 N., R.18 W., Goodhue County, Hydrologic Unit 07040002, at bridge on county road, 0.5 mile upstream from mouth, 4.4 miles west of Cannon Falls.	11.3	1969-72, 1974-76, 1979-80, 1984, 1987	4-29-87	1.42
05355080	Prairie Creek near Cannon Falls, MN	Lat 44°29'10", long 92°59'14", on line between secs.21 and 28, T.112 N., R.18 W., Goodhue County, Hydrologic Unit 07040002, at bridge on State Highway 19, 4.5 miles southwest of Cannon Falls.	79.0	1966-70, 1974, 1976, 1980, 1984, 1987	4-29-87	22
		Spring Creek basin				
05355260	Spring Creek near Red Wing, MN	Lat 44°33'42", long 92°36'42", on line between secs.27 and 28, T.113 N., R.15 W., Goodhue County, Hycrologic Unit 07040002, at bridge on County Highway 53, 4 miles west of Red Wing.	23.1	1969-71, 1974, 1976-77 1980, 1984-85, 1987	4-21-84	10
		Hay Creek Basin				
05355280	Hay Creek at Red Wing, MN	Lat 44°33'09", long 92°33'46", in SE¼NW¼ sec.36, T.113 N., R.15 W., Goodhue County, Hydrologic Unit 07040001, at bridge on county road in Red Wing, 1.9 miles upstream from mouth.	45.6	1939-41 1969-71, 1974, 1976-77, 1980, 1984-85, 1987	4-21-87	34
		Bullard Creek Basin				
05355340	Bullard Creek at Wacouta, MN	Lat 44°32'39", long 92°26'02", in SE¼SE¼ sec.36, T.113 N., R.14 W., Goodhue County, Hydrologic Unit 07040001, at U.S. Highway 61.	-	1985, 1987	4-21-87	6.27
		Wells Creek basin				
05355350	Wells Creek near Frontenac, MN	Lat 44°30'32", long 92°19'26", in NE¼NW¼ sec.13, T.112 N., R.13 W., Goodhue County, Hydrologic Unit 07040001, at bridge on county road leading to Old Frontenac, 1.2 miles south of Old Frontenac, 1.5 miles east of Frontenac.	68.9	1968-71 1974, 1976-77, 1980, 1984-85, 1987	4-21-87	42

DISCHARGE AT PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

Discharge measurements made at low-flow partial-record stations during water year 1987.--Continued

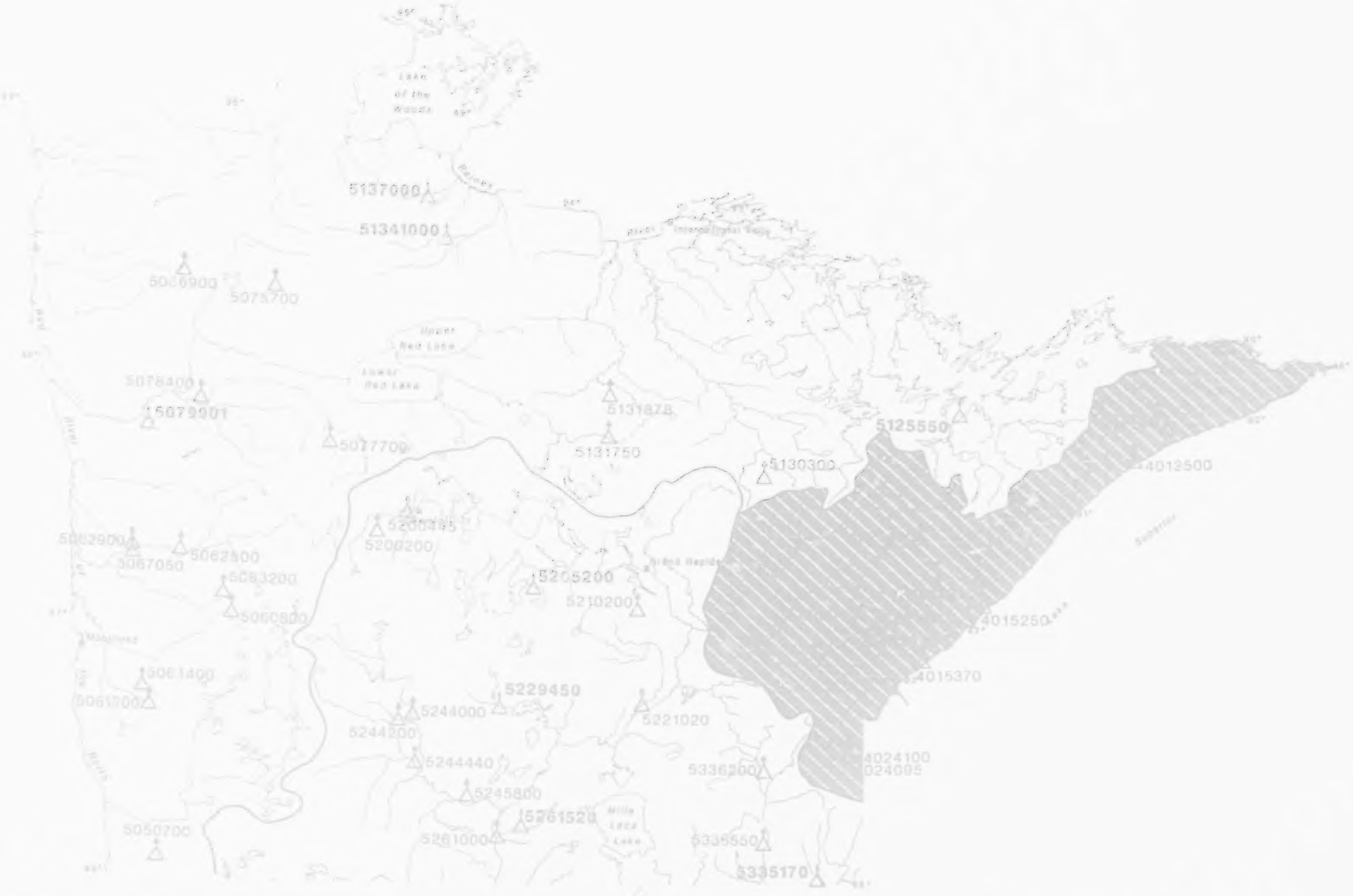
Station No.	Station name	Location	Drainage area (mi^2)	Period of record	Measurements	
					Date	Discharge (ft^3/s)
		Gilbert Creek Basin				
05355355	Gilbert Creek at Lake City, MN	Lat 44°27'31", long 92°17'33", in NE¼SE¼ sec.31, T.112 N., R.12 W., Goodhue County, Hydrologic Unit 07040001, County Road 5, at northwest corner of Lake City.	-	1985, 1987	4-21-87	11
		Iowa River Basin				
05455900	Cedar River near Blooming Prairie, MN	Lat 43°51'47", long 93°00'24", on line between secs.29 and 32, T.105 N., R.18 W., Dodge County, Hydrologic Unit 07080201, at bridge on County Highway 2, 2.1 miles east of Blooming Prairie.	81.6	1971, 1974, 1976, 1984-85, 1987	4-24-87	13
05455930	Roberts Creek near Lansing, MN	Lat 43°45'32", long 92°56'59", on line between secs.1 and 2, T.103 N., R.18 W., Mower County, Hydrologic Unit 07080201, at bridge on county road, 0.4 mile upstream from mouth, 1.4 miles northeast of Lansing.	59.9	1969, 1971, 1974, 1976, 1980, 1987	4-24-87	7.61
05455960	Wolf Creek at Austin, MN	Lat 43°41'28", long 92°57'36", in SW¼SE¼ sec.26, T.103 N., R.18 W., Mower County, Hydrologic Unit 07080201, at bridge on County Highway 25, in Todd Park at Austin, 0.3 mile upstream from mouth.	10.6	1969, 1971, 1974, 1976, 1980, 1984, 1987	4-24-87	4.29
05456500	Turtle Creek near Austin, MN	Lat 43°41'05", long 93°02'15", in NE¼NW¼ sec.31, T.103 N., R.18 W., Mower County, Hydrologic Unit 07080201, at bridge on county road, 3 miles west of Austin.	144	1946, 1947-51#, 1969, 1971, 1984,	4-24-87	20
05457160	Rose Creek near Austin, MN	Lat 43°36'48", long 92°58'10", on line between secs.26 and 27, T.102 N., R.18 W., Mower County, Hydrologic Unit 07080201, at bridge on County Highway 29, 0.3 mile upstream from mouth, 3.8 miles south of Austin.	65.8	1969, 1971, 1974, 1976, 1980, 1984-85, 1987	4-23-87	25
05457220	Woodbury Creek near Lyle, MN	Lat 43°30'37", long 93°00'34. on line between sec.32 and 33, T.101 N., R.18 W., Mower County, Hydrologic Unit 07080201, at bridge on State Highway 105, 3.3 miles west of Lyle.	40.4	1971, 1974, 1976, 1984-85, 1987	4-23-87	20
05457280	Otter Creek at Lyle, MN	Lat 43°30'00", long 92°55'52", in SE¼SE¼ sec.36, T.101 N., R.18 W., Mower County, Hydrologic Unit 07080201, at bridge on county road on Minnesota-Iowa border in Lyle.	38.3	1971, 1974, 1984, 1987	4-23-87	22
05457390	Deer Creek near Myrtle, MN	Lat 43°30'00", long 93°07'36", in SW¼SW¼ sec.33, T.101 N., R.19 W., Freeborn County, Hydrologic Unit 07080201, on township road on Minnesota-Iowa border, at Deer Creek, 4.8 miles southeast of Myrtle.	-	1987	4-23-87	7.40
05458960	Bancroft Creek at Bancroft, MN	Lat 43°42'09", long 93°21'23", in SW¼SE¼ sec.21, T.103 N., R.21 W., Freeborn County, Hydrologic Unit 07080202, at bridge on County Road 14, 1.6 miles northeast of Fountain Lake, 1 mile north of Interstate 90.	a29	1985, 1986-87+	4-23-87 5-14-87	9.53 6.67

DISCHARGE AT PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

Discharge measurements made at low-flow partial-record stations during water year 1987.--Continued

Station No.	Station name	Location	Drainage area (mi^2)	Period of record	Measurements Date	Measurements Discharge (ft^3/s)
		Iowa River Basin.--Continued				
05458970	Shell Rock River at Gordonsville, MN	Lat 43°30'51", long 93°16'06", on line between secs.29 and 32, T.101 N., R.20 W., Freeborn County, Hydrologic Unit 07080202, at bridge on County Highway 1, 0.8 mile west of Gordonsville.	191	1971, 1974, 1976, 1980, 1984, 1985, 1987	4-23-87	72
05458975	Goose Creek near Gordonsville, MN	Lat 43°30'13", long 93°16'24", in NE¼SE¼ sec.31, T.101 N., R.20 W., Freeborn County, Hydrologic Unit 07080202, at bridge on County Highway 1, 0.2 mile upstream from mouth, 1.1 miles southwest of Gordonsville.	53.8	1971, 1974, 1976, 1980, 1984-85, 1987	4-23-87	28
05459020	Steward Creek near Conger, MN	Lat 43°34'58", long 93°32'54", in NE¼NE¼ sec.2, T.101 N., R.23 W., Freeborn County, Hydrologic Unit 07080203, on township road, 1.5 miles upstream of Bear Lake, 2 miles southwest of Conger, 4 miles north of Emmons.		1987	4-22-87	5.43
05459040	Lime Creek near Emmons, MN	Lat 43°30'00", long 93°33'29", in SW¼SE¼ sec.35, T.101 N., R.23 W., Freeborn County, Hydrologic Unit 07080203, at bridge on County Highway 60, 3.5 miles west of Emmons.	58.4	1971, 1974, 1976, 1980, 1984-85, 1987	4-22-87	9.23

+ Operated as a high-flow partial record site.
# Operated as a continuous record station.
* Provided by Minnesota Pollution Control Agency.
a Approximately.
b Revised station identification number.


Lake of the Woods
Rainy
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International Falls
5066900
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Upper Red Lake
Lower Red Lake
5078400
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5131750
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4012500
Superior
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Grand Rapids
4015250
Lake
4015370
Moorhead
5061400
5061200
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5244000
5244200
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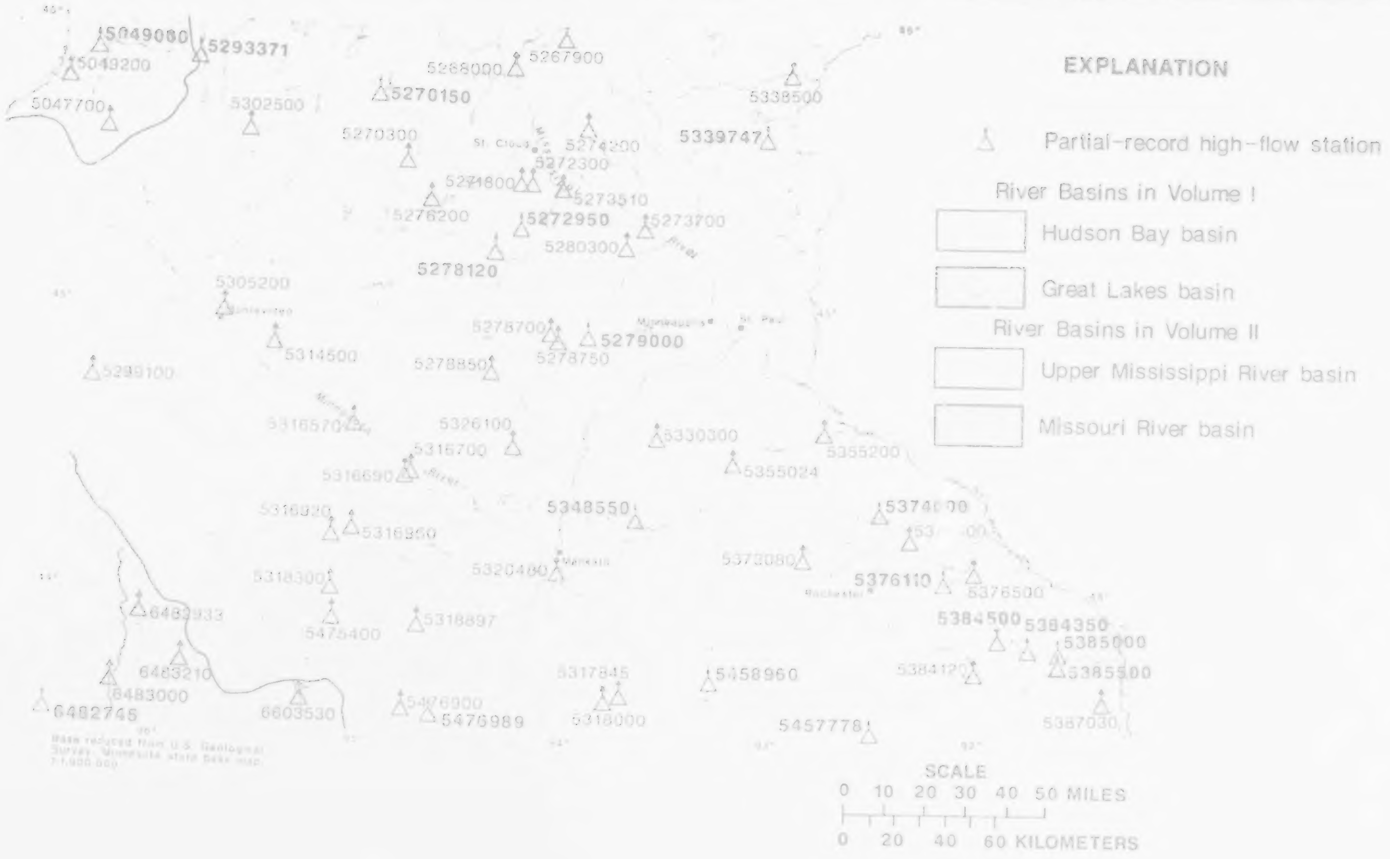


EXPLANATION
Partial-record high-flow station
River Basins in Volume I
Hudson Bay basin
Great Lakes basin
River Basins in Volume II
Upper Mississippi River basin
Missouri River basin
5049080
5049200
5047700
5293371
5302500
5288000
5267900
5270150
5270300
5338500
5339747
St. Cloud
5274200
5272300
5271800
5273510
5276200
5272950
5273700
5280300
5278120
5305200
Montevideo
5314500
5299100
5278700
5279000
5278750
5278850
Minneapolis
St. Paul
5316570
5326100
5316700
5316690
5330300
5355200
5355024
5316920
5316950
5348550
5374000
5320480
Mankato
5373080
5376110
Rochester
5376500
5318300
6482933
5475400
5318897
5384500
5384350
5385000
5384120
5385500
6483210
6483000
6482745
6603530
5476900
5476989
5317845
5318000
5458960
5457778
5387030
Base reduced from U.S. Geological Survey, Minnesota state base map 1:1,000,000
SCALE
0 10 20 30 40 50 MILES
0 20 40 60 KILOMETERS

Figure 10.---Location of high-flow partial-record stations

DISCHARGE AT PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

High-flow partial-record stations

The following table contains annual maximum discharge for high-flow stations. A high-flow partial-record station is equipped with a crest-stage gage, a device which will register the peak stage occurring between inspections of the gage. A stage-discharge relation for each gage is developed from discharge measurements made by indirect measurements of peak flow or by current meter. The date of the maximum discharge is not always certain but is usually determined by comparison with nearby continuous-record stations, weather records, or local inquiry. Only the maximum discharge for each water year is given. Information on some lower floods may have been obtained, and discharge measurements may have been made for purposes of establishing the stage-discharge relation, but these are not published herein. The years given in the period of record represent water years for which the annual maximum has been determined.

Annual maximum discharge at high-flow partial-record stations during water year 1987

Station No.	Station name	Location	Drainage area (mi^2)	Period of Record	Date	Annual maximum Gage height (feet)	Discharge (ft^3/s)
			Mississippi River main stem				
05200200	Hennepin Creek near Becida, MN	Lat 47°23'52", long 95°05'12", in NW¼NE¼ sec.11, T.145 N., R.35 W., Hubbard County, Hydrologic Unit 07010101, gages upstream and downstream from culvert on Stumphges Rapids Trail approximately 0.5 mile west of Hubbard County Road 3, 3 miles north of Becida, 1.5 miles upstream from mouth.	41.4	1979-87	5-23-87	a12.36	72
05200445	Mississippi River at Bemidji, MN	Lat 47°27'04", long 94°54'23", in NW¼NW¼ sec.20, T.146 N., R.33 W., Beltrami County, Hydrologic Unit 07010101, at bridge on County Highway 11, 1.5 miles southwest of intersection of U.S. Highway 2 and County Highway 7 in Bemidji	b400	1973-87	5-29-87	11.51	454
			Leech Lake River basin				
05205200	Boy River near Remer, MN	Lat 47°04'51", long 94°05'54", in SE¼SE¼ sec.28 T.142 N., R.27 W., Cass County, Hydrologic Unit 07010102, at bridge on County Highway 53, 1.9 miles upstream from Boy Lake and 9 miles northwest of Remer.	310	1986-87	7-23-87	c11.64	660
			Smith Creek basin				
05210200	Smith Creek near Hill City, MN	Lat 47°04'58", long 93°34'59", in SE¼NW¼ sec.13, T.53 N., R.26 W., Itasca County, Hydrologic Unit 07010101, at culvert on U.S. Highway 169, 6.2 miles north of Hill City.	8.00	1961-87	5-22-87	4.30	26
			Willow River basin				
05221020	Willow River below Palisade, MN	Lat 46°42'36", long 93°33'21", in NW¼NE¼ sec.30, T.49 N., R.25 W., Aitkin County, Hydrologic Unit 07010103, at bridge on County Highway 3, 3.2 miles west of Palisade.	445	1972-87	5-28-87	11.28	1,130
			Pine River basin				
05229450	Pine River near Pine River, MN	Lat 46°41'39", long 94°22'11", in NE¼SE¼ sec.8., T.137 N., R.29 W., Cass County, Hyrologic Unit 07010105, at bridge 2.3 miles southeast of Pine River, on U.S. Highway 371, 4.9 miles upstream of upper Whitefish Lake.	285	1986-87	5-22-87	3.52	770

"See footnotes at end of the table."

DISCHARGE AT PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

Annual maximum discharge at high-flow partial-record stations during water year 1987--Continued

Station No.	Station name	Location	Drainage area (mi^2)	Period of Record	Annual maximum Date	Annual maximum Gage height (feet)	Annual maximum Discharge (ft^3/s)
		Crow Wing River basin					
05244000	Crow Wing River at Nimrod, MN	Lat 46°38'25", long 94°52'44", in SE¼NW¼ sec 32, T.137 N., R.33 W., Wadena County, Hydrologic Unit 07010106, 200 ft upstream from bridge on County Highway 121, 0.2 mile north of Nimrod, 0.7 mile upstream of Cat River.	b1,010	1910-14#, 1931-81#, 1982-87	5-28-87	3.89	894
05244200	Cat River near Nimrod, MN	Lat 46°37'44", long 94°56'55", in SW¼NW¼ sec [illegible], T.137 N., R.34 W., Wadena County, Hydrologic Unit 07010106, at bridge on State Highway 227, [illegible] miles west of Nimrod, [illegible] miles upstream from mouth.	49.2	1961-87	5-21-87	4.68	79
05244440	Leaf River near Aldrich, MN	Lat [illegible], long [illegible], in [illegible] sec [illegible], T.[illegible] N., R.[illegible] W., Wadena County, Hydrologic Unit 07010107, at bridge on County Highway [illegible], [illegible] miles upstream from mouth, [illegible] miles northeast of Aldrich.	890	1972-87	5-28-87	11.71	1,120
05245800	Sevenmile Creek near Pillager, MN	Lat 46°[illegible], long [illegible], in SW¼SE¼ sec [illegible], T.[illegible] N., R.31 W., Cass County, Hydrologic Unit 07010106, at [illegible] wing wall of bridge on [illegible], [illegible] miles northwest of Pillager, [illegible] miles upstream from mouth.	18.3	1979-87	5-22-87	11.21	46
		Mississippi River basin					
05261000	Mississippi River near Fort Ripley, MN	Lat 46°[illegible], long 94°21'50", in SE¼NW¼ sec [illegible], T.[illegible] N., R.32 W., Crow Wing County, Hydrologic Unit 07010104, on left bank 850 ft upstream from Nokasippi River, 1.0 mile north of Fort Ripley.	11,010	1929#, 1972-87	5-27-87	1142.34	11,800
		Nokasippi River basin					
05261520	Nokasippi River near Fort Ripley, MN	Lat 46°12'02", long 94°19'03", on line between [illegible] sec 26, T.43 N., R.32 W., Crow Wing County, Hydrologic Unit 07010104, at bridge on [illegible] Highway 2, 3 miles northeast of Fort Ripley.	178	1967-70, 1974, 1976, 1986-87	3-22-87	8.74	150
		Platte River basin					
05267900	Hillman Creek near Pierz	Lat 45°[illegible], long [illegible], in NE¼SE¼ sec [illegible], T.40 N., R.30 W., Morrison County, Hydrologic Unit 07010201, at bridge on county highway, [illegible] miles upstream from mouth, 4.5 miles east of Pierz.	46.7	1984-87	5-22-87	d	e30
05268000	Platte River above Royalton, MN	Lat 45°50'41", long 94°17'40", in SE¼NW¼ sec 20, T.[illegible] N., R.32 W., Morrison County, Hydrologic Unit 07010201, at bridge on County Highway 27, 0.8 mile north of Royalton, 6.6 miles upstream from mouth.	335	1929-38#, 1972-87	3-23-87	8.99	360
		Sauk River basin					
05270150	Ashley Creek near Sauk Centre, MN	Lat 45°[illegible], long 94°58'52", in NW¼SE¼ sec 24, T.127 N., R.34, Todd County, Hydrologic Unit 07010202, at bridge on County Highway 31, [illegible] miles north of Sauk Centre.	113	1968-70, 1974, 1976, 1987	5-21-87	d	e31

See footnotes at end of the table.

DISCHARGE AT PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

Annual maximum discharge at high-flow partial-record stations during water year 1987--Continued

Station No.	Station name	Location	Drainage area (mi^2)	Period of Record	Annual maximum Date	Annual maximum Gage height (feet)	Annual maximum Discharge (ft^3/s)
		Sauk River Basin--Continued					
05270300	Sauk River tributary at Spring Hill, MN	Lat 45°31'22", long 94°48'31", in SW¼NE¼ sec.27, T.124 N., R.33 W., Stearns County, Hydrologic Unit 07010202, at culvert on State Highway 4, 1.0 mile east of Spring Hill, 2.7 miles upstream from mouth.	7.06	1960-87	5-21-87	11.71	245
		Johnson Creek basin					
05271800	Johnson Creek tributary at Luxemburg, MN	Lat 45°26'30", long 94°14'46", in NW¼NE¼ sec.30, T.123 N., R.28 W., Stearns County, Hydrologic Unit 07010203, at culverts on State Highway 15, 0.8 mile south of Luxemburg.	3.82	1964-87	7-20-87	6.56	11
05272300	Johnson Creek near St. Augusta, MN	Lat 45°27'48", long 94°09'19", in NW¼SW¼ sec.14, T.123 N., R.28 W., Stearns County, Hydrologic Unit 07010203, at bridge on County Highway 7, 1.0 mile south of St. Augusta, 4.3 miles upstream from mouth.	46.7	1964-87	7-20-87	d	e40
		Clearwater River basin					
05272050	Clearwater River near South Haven, MN	Lat 45°16'45", long 94°15'04", in NE¼NW¼ in sec.19, T.121 N., R.28 W., Wright County, Hydrologic Unit 07010203, at culvert 3.4 miles southeast of Kimball, 0.25 mile downstream of Scott Lake Outlet 2.0 miles southeast of South Haven.	-	1985-87	3-23-87	13.50	78
		Mississippi River main stem					
05273510	Mississippi River at Clearwater, MN	Lat 45°25'15", long 94°02'37", in NW¼SW¼ sec.23, T.34 N., R.30 W., Sherburne County, Hydrologic Unit 07010203, on left bank 700 ft upstream from bridge, on State Highway 24 at Clearwater.	-	1972-87	5-29-87	11.51	12,700
		Otsego Creek basin					
05273700	Otsego Creek near Otsego, MN	Lat 45°17'19", long 93°38'59", in SW¼NE¼ sec.13, T.131 N., R.24 W., Wright County, Hydrologic Unit 07010203, at culvert on County Highway 39, 1.3 miles upstream from mouth, 1.9 miles west of Otsego.	3.11	1964-87	7-24-87	3.39	42
		Elk River basin					
05274200	Stony Brook tributary near Foley, MN	Lat 45°38'42", long 93°54'54", in NE¼NW¼ sec.2, T.36 N., R.29 W., Benton County, Hydrologic Unit 07010203, at culvert on State Highway 25, 0.3 mile upstream from mouth, 1.5 miles south of Foley.	2.26	1960-87	5-22-87	d	e5
		Crow River basin					
05276200	North Fork Crow River at Paynesville, MN	Lat 45°23'09", long 94°42'41", in SW¼SE¼ sec.9, T.122 N., R.32 W., Stearns County, Hydrologic Unit 07010204, at bridge on county road at northeast edge of Paynesville city limits.	236	1973-87	3-23-87	d	e62

[a] See footnotes at end of the table.

DISCHARGE AT PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

Annual maximum discharge at high-flow partial-record stations during water year 1987--Continued

Station No.	Station name	Location	Drainage area (mi^2)	Period of Record	Date	Annual maximum Gage height (feet)	Discharge (ft^3/s)
		Crow River basin--Continued					
05278120	North Fork Crow River near Kingston, MN	Lat 45°12'13", long 94°23'16", in SW¼SE¼ sec.13, T.120 N., Meeker County, Hydrologic Unit 07010204, at bridge on State Highway 24, 3.7 miles west of Kingston, 3.9 miles east of Forest City.	-	1986-87	3-23-87	d	e500
05278700	Otter Creek near Lester Prairie, MN	Lat 44°54'23", long 94°04'24", in SE¼SE¼ sec.28, T.117 N., R.27 W., McLeod County, Hydrologic Unit 07010205, at culvert on State Highway 7, 2.1 miles northwest of Lester Prairie, 4.4 miles upstream from mouth.	30.2	1961-87	7-25-87	d	e10
05278750	Otter Creek tributary near Lester Prairie, MN	Lat 44°53'34", long 94°04'24", in SE¼SE¼ sec.33, T.117 N., R.27 W., McLeod County, Hydrologic Unit 07010205, at culvert on County Highway 63, 1.7 miles northwest of Lester Prairie, 3.3 miles upstream from mouth.	1.54	1962-87	6-20-87	8.00	5
05278850	Buffalo Creek tributary near Brownton, MN	Lat 44°45'55", long 94°22'33", in NE¼SE¼ sec.13, T.115 N., R.30 W., McLeod County, Hydrologic Unit 07010205, at culvert on State Highway 15, 0.6 mile upstream from mouth, 2.6 miles northwest of Brownton.	9.45	1961-87	7-12-87	d	e10
05279000	South Fork Crow River near Mayer, MN	Lat 44°54'20", long 93°53'05", in SW¼SW¼ sec.30, T.117 N., R.25 W., Carver County, Hydrologic Unit 07010205, near center of span on downstream side of bridge on State Highway 7, 1.3 miles north of Mayer, 4.3 miles southwest of Watertown, 16 miles upstream from confluence with North Fork.	1,170	1934-79#, 1980-84, 1987	3-28-87	d	e456
05280300	School Lake Creek tributary near St. Michael, MN	Lat 45°12'09", long 93°41'31", in NW¼SE¼ sec.15, T.120 N., R.24 W., Wright County, Hydrologic Unit 07010204, at culvert on county highway, 0.2 mile upstream from mouth, 1.5 miles southwest of St. Michael.	2.04	1964-87	7-24-87	d	e9
		Minnesota River basin					
05293371	Pomme de terre River near Elbow Lake, MN	Lat 45°57'47", long 95°53'07", in SE¼SW¼ sec.19, T.129 N., R.41 W., Grant County, Hydrologic Unit 07020002, at bridge on County Road 47, 4 miles southeast of Elbow Lake, 2.5 miles south of the outlet of Pomme de Terre Lake, in a national water fowl production area.	340	1986-87	3-23-87	d	e130
05299100	Lazarus Creek tributary near Canby, MN	Lat 44°43'04", long 96°19'42",in NE¼NW¼ sec.6, T.114 N., R.45 W., Yellow Medicine County, Hydrologic Unit 07020003, at culvert on State Highway 68, 2.7 miles west of Canby, 4.2 miles upstream from mouth.	2.97	1960-87	3-8-87	f10.19	59

"See footnotes at end of the table."

DISCHARGE AT PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

Annual maximum discharge at high-flow partial-record stations during water year 1987--Continued

Station No.	Station name	Location	Drainage area (mi^2)	Period of Record	Annual maximum		
					Date	Gage height (feet)	Discharge (ft^3/s)
		Minnesota River basin--Continued					
05302500	Little Chippewa River near Starbuck, MN	Lat 45°36'52", long 95°37'12", in NW¼NE¼ sec.30, T.125 N., R.39 W., Pope County, Hydrologic Unit 07020005, at downstream wing wall on triple box culvert on State Highway 28, 4.4 miles west of Starbuck.	69.6	1979-87	3-23-87	c12.53	115
05305200	Spring Creek near Montevideo, MN	Lat 44°58'41", long 95°42'57", in NW¼NW¼ sec 5, T.117 N., R.40 W., Chippewa County, Hydrologic Unit 07020005, at culvert on State Highway 29, 1.2 miles upstream from mouth, 2.0 miles north of Montevideo.	16.0	1959-87	3-8-87	13.52	55
05314500	Hawk Creek near Maynard, MN	Lat 44°52'10", long 95°28'58", in SW¼NW¼ sec 7, T.116 N., R.38 W., at Renville and Chippewa County line, Hydrologic Unit 07020004, at right downstream side of bridge on State Highway 23, 3.0 miles southwest of Maynard.	474	1949-54#, 1981-87	3-22-87	13.38	870
05316570	Beaver Creek at Beaver Falls, MN	Lat 44°35'03", long 95°02'49", in NE¼NW¼ sec.22, T.113 N., R.35 W., Renville County, Hydrologic Unit 07020004, at bridge on County Highway 2 in Beaver Falls, 2.2 miles upstream from mouth, 3.8 miles northwest of Morton.	194	1972-87	3-23-87	d	e220
05316690	Spring Creek tributary near Sleepy Eye, MN	Lat 44°23'54", long 94°45'35", in NW¼ sec.25, T.111 N., R.33 W., Brown County, Hydrologic Unit 07020007, at culvert on county highway, 0.1 mile upstream from mouth, 7.5 miles north of Sleepy Eye.	3.69	1966-87	3-24-87	d	e3
05316700	Spring Creek near Sleepy Eye, MN	Lat 44°24'12", long 94°44'41", in NE¼SE¼ sec.24, T.111 N., R.33 W., Brown County, Hydrologic Unit 07020007, at culvert on county highway, 4.3 miles upstream from mouth, 7.5 miles north of Sleepy Eye.	31.3	1959-87	3-24-87	9.40	54
05316920	Cottonwood River tributary No. 2 near Sanborn, MN	Lat 44°10'34", long 95°07'15", in SW¼NW¼ sec.12, T.108 N., R.36 W., Cottonwood County, Hydrologic Unit 07020008, at culvert on U.S. Highway 71, 2.4 miles south of Sanborn.	.42	1966-87	3-25-87	3.94	10
05316950	Cottonwood River near Springfield, MN	Lat 44°12'12", long 95°02'53", on line between secs.33 and 34, T.109 N., R.35 W., Brown County, Hydrologic Unit 07020008, at bridge on County Highway 2, 1.3 miles downstream from Mound Creek, 1.0 mile upstream from Coal Mine Creek, 3.5 miles southwest of Springfield.	773	1973-87	3-27-87	c20.75	2,250
05317845	East Branch Blue Earth River near Walters, MN	Lat 43°37'58", long 93°42'28", in SE¼SE¼ sec 16, T.102 N., R.24 W., Faribault County, Hydrologic Unit 07020009, at left downstream wing wall of box culvert on State Highway 22, 2.5 miles northwest of Walters.	29.6	1979-87	10-12-86	15.10	265

See footnotes at end of the table.

DISCHARGE AT PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

Annual maximum discharge at high-flow partial-record stations during water year 1987--Continued

Station No.	Station name	Location	Drainage area (mi^2)	Period of Record	Annual maximum		
					Date	Gage height (feet)	Discharge (ft^3/s)
		Minnesota River basin--Continued					
05318000	East Branch Blue Earth River near Bricelyn, MN	Lat 43°37'50", long 93°47'25", in NE¼NE¼ sec.23, T.102 N., R.25 W., Faribault County, Hydrologic Unit 07020009, at bridge on county highway, 2.0 miles upstream from Brush Creek, 3.0 miles downstream from South Walnut Lake, 5.0 miles northeast of Bricelyn.	132	1973-87	10-12-86	7.77	280
05318300	Watonwan River near Delft, MN	Lat 43°59'55", long 95°07'11", in NE¼SE¼ sec.11, T.106 N., R.36 W., Cottonwood County, Hydrologic Unit 07020010, at culvert on U.S. Highway 71, 1.7 miles northwest of Delft.	13.0	1960-87	3-23-87	15.22	53
05318897	South Fork Watonwan River near Ormsby, MN	Lat 43°53'08", long 94°41'27", in SE¼NW¼ sec.21, T.105 N., R.32 W., Watonwan County, Hydrologic Unit 07020010, at right downstream wing wall of bridge on township road, 2.6 miles north of Ormsby, 5.0 miles upstream from mouth at Willow Creek.	109	1979-87	3-27-87	11.89	258
05320480	Maple River near Rapidan, MN	Lat 44°03'54", long 94°01'32", in SW¼ sec.13, T.107 N., R.27 W., Blue Earth County, Hydrologic Unit 07020011, at bridge on County Highway 35, 3.0 miles southeast of Rapidan, 2.7 miles upstream from mouth.	343	1972-87	10-14-86	8.86	880
05326100	Middle Branch Rush River near Gaylord, MN	Lat 44°30'27", long 94°15'00", in SW¼NW¼ sec.18, T.112 N., on line between R.28 W. and R.29 W., Sibley County, Hydrologic Unit 07020012, at downstream side of bridge on township road, 3.0 miles southwest of Gaylord, 10.5 miles upstream from the main branch of Rush River.	68.5	1979-87	6-23-87	14.19	405
05330300	Sand Creek near New Prague, MN	Lat 44°32'37", long 93°32'16", in NE¼NW¼ sec.1, T.112 N., R.23 W., Le Sueur County, Hydrologic Unit 07020012, at culvert on State Highway 13 and 19, 1.9 miles east of New Prague.	62.4	1960-87	10-11-86	11.22	350
		St. Croix River basin					
05335170	Crooked Creek near Hinckley, MN	Lat 46°00'42", long 92°31'45", in NE¼NE¼ sec.30, T.41 N.,R.17 W., Pine County, Hydrologic Unit 07030001, at triple box culvert on State Highway 48, 2.7 miles upstream from mouth, 8 miles south of Duxbury, 19 miles east of Hinckley.	93	1966-70, 1974-76, 1979-80, 1986-87	4-28-87	10.26	128
05336200	Glaisby Brook near Kettle River, MN	Lat 46°27'19", long 92°51'34", in SE¼NW¼ sec.22, T.46 N., R.20 W., Carlton County, Hydrologic Unit 07030003, at bridge on State Highways 27 and 73, 1.0 mile upstream from mouth, 2.4 miles south of Kettle River.	27.5	1960-70#, 1971-87	5-23-86	3.86	130

"See footnotes at end of the table."

Annual maximum discharge at high-flow partial-record stations during water year 1987--Continued

Station No.	Station name	Location	Drainage area (mi^2)	Period of Record	Annual maximum		
					Date	Gage height (feet)	Discharge (ft^3/s)
		St. Croix River Basin--Continued					
05336550	Wolf Creek tributary near Sandstone, MN	Lat 46°09'45", long 92°51'58", in NE¼SE¼ sec.33, T.43 N., R.20 W., Pine County, Hydrologic Unit 07030003, at culvert on U.S. Highway 61, 0.2 mile upstream from mouth, 2.2 miles north of Sandstone.	5.46	1960-87	10-21-86	15.22	2.1
05338500	Snake River near Pine City, MN	Lat 45°50'30", long 92°56'00", in SE¼NW¼ sec.28, T.39 N., R.21 W., Pine County, Hydrologic Unit 07030004, on left bank at site of former powerplant and dam, 0.5 mile downstream from Cross Lake and 1.5 miles northeast of Pine City.	958	1913-17, 1951-81#, 1982-87	5-27-87	d	e791
05339747	Goose Creek at Harris, MN	Lat 45°33'11", long 92°58'39", in SW¼SW¼ sec.21, T.36 N., R.21 W., Chisago County, Hydrologic Unit 07030005, at culverts on County Highway 8, 0.15 mile east of County Highway 30 in Harris, 8 miles above mouth.	b60	1986-87	3-27-87	d	e10
		Cannon River basin					
05348550	Cannon River below Sabre Lake near Kilkenny, MN	Lat 44°17'50", long 93°37'44", in NE¼NE¼ sec. 31, T.110 N., R.23 W., LeSueur County, Hydrologic Unit 07040002, at right downstream side of bridge, on township road, 0.25 mile downstream of Sabre Lake, 3 miles southeast of Kilkenny.	-	1985-87	10-12-86	g	e150
05355024	Cannon River at Northfield, MN	Lat 44°27'19", long 93°09'46", in NE¼NE¼ sec.1, T.111 N., R.20 W., Rice County, Hydrologic Unit 07040002, on left bank at downstream side of Fifth Street bridge in Northfield.	934	1980-87	10-13-86	d	e1,150
05355200	Cannon River at Welch, MN	Lat 44°33'50", long 92°43'55", in NW¼SW¼ sec.27, T.113 N., R.16 W., Goodhue County, Hydrologic Unit 07040002, on right bank 0.3 mile downstream from highway bridge at Welch, 1.8 miles upstream from Belle Creek.	1,320	1909-14#, 1930-71#, 1973-87	10-14-86	7.22	4,200
		Zumbro River basin					
05373080	Milliken Creek near Concord, MN	Lat 44°07'13", long 92°49'08", in NW¼NW¼ sec.36, T.108 N., R.17 W., Dodge County, Hydrologic Unit 07040004, at bridge on County Road 9, 8.6 miles upstream from mouth, 2.1 miles southeast of Concord.	22.2	1979-87	10-12-86	h12.17	235
05374000	Zumbro River at Zumbro Falls, MN	Lat 44°17'12", long 92°25'56", in sec.36, T.110 N., R.14 W., Wabasha County, Hydrologic Unit 07040004, on left bank in Zumbro Falls, 1,000 ft downstream from Cold Creek, 0.7 mile upstream from bridge on U.S. Highway 63, 6.3 miles downstream from North North Fork Zumbro River.	1,130	1909-17, 1929, 1930-80#, 1985-87	10-12-86	h15.88	10,400

See footnotes at end of the table.

DISCHARGE AT PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

Annual maximum discharge at high-flow partial-record stations during water year 1987--Continued

Station No.	Station name	Location	Drainage area (mi^2)	Period of Record	Annual maximum		
					Date	Gage height (feet)	Discharge (ft^3/s)
		Zumbro River basin--Continued					
05374400	Long Creek near Potsdam, MN	Lat 44°10'48", long 92°17'23", at quarter corner on north line of sec.8, T.108 N., R.12 W., Wabasha County, Hydrologic Unit 07040004, at culvert on county highway, 2.6 miles northeast of Potsdam.	4.46	1986-87	10-12-86	14.65	82
		Whitewater River basin					
05376110	Middle Fork Whitewater River near State Park Group Camp near St. Charles, MN	Lat 44°03'21", long 92°03'13", in SW¼ sec.20, T.107 N., R.10 W., Olmsted County, Hydrologic Unit 07040003, at wooden bridge near Group Camp in Whitewater State Park.	--	1986-87	10-12-86 g		§
05376500	South Fork Whitewater River near Altura, MN	Lat 44°04'10", long 91°58'49", in SE¼ sec.14, T.107 N., R.10 W., Winona County, Hydrologic Unit 07040003, on left bank 500 ft upstream from highway bridge, 2.0 miles west of Altura, 2.4 miles upstream from Keefer Creek.	76.8	1939-71#, 1973-87	10-12-86	6.92	2,090
		Root River basin					
05384120	South Branch Root River at Lanesboro, MN	Lat 43°43'19", long 91°58'43", in NW¼SE¼ sec.13, T.103 N., R.10 W., Fillmore County, Hydrologic Unit 07040008, at bridge to ball park in Lanesboro, 2.5 miles upstream from mouth.	b297	1973-86	10-13-86 d		§
05384350	Root River at Rushford, MN	Lat 43°48'11", long 91°45'10", in NE¼NE¼ sec.23, T.104 N., R.8 W., Fillmore County, Hydrologic Unit 07040008, on right downstream side of U.S. Highway 16 bridge on south side of Rushford.	--	1985-87	10-13-86 d		§
05384500	Rush Creek near Rushford, MN	Lat 43°50'00", long 91°46'40", on line between secs.3 and 10, T. 104 N., R.8 W., Fillmore County, Hydrologic Unit 07040008, on downstream side near center of span of highway bridge, 1.5 miles northwest of Rushford, 3.0 miles upstream from mouth.	129	1942-79#, 1980-87	10-12-86	2.98	390
05385000	Root River near Houston, MN	Lat 43°46'07", long 91°34'11", in SW¼NW¼ sec.33, T.104 N., R.6 W., Houston County, Hydrologic Unit 07040008, on right bank 0.2 mile north of Houston, 1.6 miles upstream of South Fork Root River, 18.2 miles upstream from mouth.	1,270	1909-17, 1929, 1930-84#, 1985-87	10-13-86	13.53	10,900
05385500	South Fork Root River near Houston, MN	Lat 43°44'19", long 91°33'50", in NE¼SW¼ sec.9, T.103 N., R.6 W., Houston County, Hydrologic Unit 07040008, on left bank, 50 feet downstream from State Highway 76 bridge, 0.5 mile upstream from Badger Creek, 1.5 mile south of Houston.	275	1953-83# 1985-87	10-12-86	8.45	982

"See footnotes at end of the table."

DISCHARGE AT PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

Annual maximum discharge at high-flow partial-record stations during water year 1987--Continued

Station No.	Station name	Location	Drainage area (mi^2)	Period of Record	Annual maximum Date	Gage height (feet)	Discharge (ft^3/s)
		Crooked Creek basin					
05387030	Crooked Creek at Freeburg, MN	Lat 43°36'37", long 91°21'39", in SW¼NE¼ sec.30, T.102 N., R.4 W., Houston County, Hydrologic Unit 07060001, on right downstream wing wall of bridge on State Highway 249 at Freeburg, 6.5 miles upstream from mouth.	44.2	1979-87	7-31-87	15.49	1,400
		Iowa River basin					
05457773	Little Cedar River near Johnsburg, MN	Lat 43°30'52", long 92°45'19", in NW¼NE¼ sec.33, T.101 N., R.16 W., Mower County, Hydrologic Unit 07080201, at bridge on County Road 6, 1 mile northeast of Johnsburg, 1 mile north Minnesota-Iowa border.	b46	1986-87	10-12-86	14.24	§
05458960	Bancroft Creek at Bancroft, MN	Lat 43°42'03", long 93°21'23", in SW¼SE¼ sec.21, T.103 N., R.21 W., Freeborn County, Hydrologic Unit 07080202, at bridge on County Road 14, 1.6 miles northeast of Fountain Lake, 1 mile north of Interstate 90.	29.1	1985+, 1986-87	10-12-86	5.46	184
		Des Moines River basin					
05475400	Warren Lake tributary near Windom, MN	Lat 43°54'02", long 95°07'13", in SE¼NE¼ sec.14, T.105 N., R.36 W., Cottonwood County, Hydrologic Unit 07100001, at culvert on U.S. Highway 71, 0.2 mile up stream from Warren Lake, 2.4 miles north of Windom.	1.39	1960-87	7-7-87	d	e5
05476900	Fourmile Creek near Dunnell, MN	Lat 43°34'57", long 94°46'26", in SW¼NW¼ sec.2, T.101 N., R.33 W., Martin County, Hydrologic Unit 07100003, at bridge on State Highway 4, 0.8 mile upstream from mouth, 1.6 miles north of Dunnell.	14.0	1960-87	3-25-87	f10.89	48
05476989	East Fork Des Moines River near Ceylon, MN	Lat 43°33'53", long 94°38'15", in NW¼SW¼ sec.11, T.101 N., R.32 W., Martin County, Hydrologic Unit 07010003, at bridge on County Road 23, 2.4 miles northwest of Ceylon.	b154	1986-87	3-27-87	16.18	295
		Big Sioux River basin					
06482745	Beaver Creek at Valley Springs, S.D	Lat 43°35'10", long 96°28'20", in NW¼NW¼ sec.3, T.101 N., R.47 W., Minnehaha County, South Dakota Hydrologic Unit 10170203, at bridge on County Road 103 (Valley Drive), 1 mile west of South Dakota-Minnesota border, 2.5 miles south of interstate 90.	b104	1986-87	3-23-87	19.68	670
06482933	Chanarambi Creek near Edgerton, MN	Lat 43°53'59", long 96°03'39", in NW¼SW¼ sec.18, T.105 N., R.43 W., near Murray and Pipestone County line, Hydrologic Unit 10170204, at right downstream wing wall of bridge on township road, 3.8 miles northeast of Edgerton, 7.4 miles upstream from mouth.	56.1	1979-87	3-23-87	h12.64	253

"See footnotes at end of the table."

DISCHARGE AT PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

Annual maximum discharge at high-flow partial-record stations during water year 1987--Continued

Station No.	Station name	Location	Drainage area (mi^2)	Period of Record	Annual maximum Date	 Gage height (feet)	 Discharge (ft^3/s)
		Big Sioux River basin--Continued					
06483000	Rock River at Luverne, MN	Lat 43°33'15", long 96°12'03", in SW¼NE¼ sec.11, T.102 N., R.45 W., Rock County, Hydrologic Unit 10170204, at bridge on Main Street (County Highway 4) in Luverne.	425	1911-14#, 1972-87	3-24-87	6.35	1,350
06483210	Kanaranzi Creek tributary No. 2 near Wilmont, MN	Lat 43°43'32", long 95°52'20", in SW¼NW¼ sec.15, T.103 N., R.42 W., Nobles County, Hydrologic Unit 10170204, at culvert on County Highway 15, 3.5 miles southwest of Wilmont, 3.7 miles upstream from mouth.	2.14	1966-87	7-5-87	5.55	128
		Little Sioux River basin					
06603530	Little Sioux River near Spafford, MN	Lat 43°36'08", long 95°15'27", in NE¼NE¼ sec.34, T.102 N., R.37 W., Jackson County, Hydrologic Unit 10230003, at bridge on county highway, 1.6 miles downstream from Jackson County ditch No. 11, 5.8 miles east of Spafford.	41.1	1962-87	7-5-87	9.28	800

+ Operated as low flow site.
# Operated as a continuous-record gaging station.
§ Discharge not determined.
a Affected by beaver dam.
b Approximately.
c Backwater from aquatic growth or debris.
d Peak stage did not reach bottom of pipe.
e Discharge estimated.
f Backwater from ice.
g Peak stage unknown.
h Affected by shifting control.

DISCHARGE AT PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

Discharge measurements at miscellaneous sites

Measurements of streamflow at points other than gaging stations are given in the following table. The measurements of base flow are designated by an asterisk (*); measurements of peak flow by a dagger (†).

Discharge measurements made at miscellaneous sites during water year 1987

Stream	Tributary to	Location	Drainage area (mi^2)	Measured previously (water years)	Measurements	
					Date	Discharge (ft^3/s)
Mississippi River main stem						
Mississippi River	Gulf of Mexico	Lat 47°15'00", long 93°35'12", in N½ sec.13, T.155 N., R.26 W., Itasca County, Hydrologic Unit 07010103, at dam at outlet of Pokegama Lake, 3.5 miles northwest of Grand Rapids, MN (05210700).	a3,360	1929-30, 1944-45, 1948-55, 1957-75, 1983-86	5-27-84 9-18-87	1,620 947
Crow Wing River basin						
Straight River	Crow Wing River	Lat 46°55'14", long 95°15'08", on line between secs.20 and 29, T.140 N., R.36 W., Becker County, Hydrologic Unit 07010106 at outlet of Straight Lake at State Highway 34 at Osage (05243720)	-	1943, 1974-76, 1984, 1986-87	9-23-86 11-6-86 3-12-87 4-14-87 4-27-87 6- 9-87 7-16-87 8- 6-87 8-27-87	45 35 30 30 27 26 22 25 25
Straight River	Crow Wing River	Lat 46°53'15", long 95°09'44" in NW¼NW¼ sec.6, T.139 N., R.35 W., Hubbard County, Hydrologic Unit 07010106, at culverts on County Road 117, on Becker-Hubbard County line, 5 miles southwest of Park Rapids (05243722).	-	1986-87	9-23-86 11-5-86 3-12-87 4-14-87 4-27-87 6- 9-87 7-16-87 8- 6-87 8-27-87	41 36 36 38 35 38 35 36 33
Straight River	Crow Wing River	Lat 46°52'35", long 95°05'57", in NE¼NE¼ sec.9, T.139 N., R.35 W., Hubbard County, Hydrologic Unit 07010106, at culvert on County Road 115, 1.6 miles west of U.S. Highway 71, 3.5 miles southwest of Park Rapids (05243724).	-	1986-87	9-22-86 11-5-87 3-12-87 3-13-87 4-15-87 4-28-87 6-10-87 7-16-87 8- 7-87 8-27-87	79 64 62 59 57 52 55 56 54 51
Mississippi River main stem						
Mississippi River	Gulf of Mexico	Lat 44°54'57", long 93°211'59", in NE¼NW¼ sec.17, T.28 N., R.23 W., Ramsey County, Hydrologic Unit 07010206, at Ford Motor Company hydroelectric plant 800 ft downstream from Ford Parkway bridge in St. Paul, MN, 3.5 miles upstream from Minnesota River, and at River mile 847.6 upstream from Ohio River (05288950).	a19,700	1924, 1935, 1938-39, 1941, 1943, 1945-50, 1954, 1957, 1959, 1961-62, 1964-70, 1972-85	9- 8-87	3,580
Bassett Creek basin						
Bassett Creek at Fruen Mill	Mississippi River	Lat 44°58'45", long 93°18'48", in SE¼ sec.20, T.29 N., R.24 W., Hennepin County, Hydrologic Unit 07010206, at Fruen Mill, 700 ft downstream from Glenwood Ave., at Minneapolis (05288900).	41.6	1952-56 1963-81, 1982-83#, 1987	7-28-87	169

"See footnotes at end of table."

DISCHARGE AT PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

Discharge measurements made at miscellaneous sites during water year 1987--Continued

Stream	Tributary to	Location	Drainage area (mi^2)	Measured previously (water years)	Measurements	
					Date	Discharge (ft^3/s)
		Minnehaha Creek basin				
Minnehaha Creek	Mississippi River	Lat 44°55'54", long 93°23'04", in NW¼NW¼ sec.20, T.117 N., R.21 W., Hennepin County, Hydrologic Unit 07010206, at bridge on Lake Street in Hopkins, 6.4 miles east of Grays Bay dam at Lake Minnetonka.	-	-	7-23-87	786
Minnehaha Creek	Mississippi River	Lat 44°54'55", long 93°14'50", in SE¼NE¼ sec.14, T.28 N., R.24 W., Hennepin County, Hydrologic Unit 07010206, at bridge on Cedar Ave., in Minneapolis, 2.8 miles upstream of mouth.	-	1977	7-23-87 7-28-87 8- 7-87	1,030 134 28
Minnehaha Creek	Mississippi River	Lat 44°54'56", long 93°12'44", in SW¼NE¼ sec.18, T.28 N., R.23 W., Hennepin County, Hydrologic Unit 07010206, at bridge on Minnehaha Ave., in Minnehaha Falls Park in Minneapolis.	-	-	7-28-87	214
		Minnesota River basin				
Chippewa River diversion	Minnesota River	Lat 45°01'30", long 95°48'00", in SE¼ sec.16, T.118 N., R.41 W., Chippewa County, Hydrologic Unit 07020001, 1 mile north of Watson, MN	-	1945-86	6- 5-87	471
Chippewa River below diversion	Minnesota River	Lat 45°01'10", long 95°47'30", in NW¼ sec.22, T.118 N., R.41 W., Chippewa County, Hydrologic Unit 07020005, 1.4 miles northeast of Watson, MN.	-	1945-86	11-20-86 1-13-87 4- 3-87 6- 5-87 7-27-87	154 151 616 186 104
Butterfield Creek	St. James Creek	Lat 44°02'11", long 94°36'31", in SE¼SW¼ sec.30, T.107 N., R.31 W., Watonwan County, Hydrologic Unit 07020010 at culvert on County Road 116, 3 miles southwest of LaSalle, 3.5 miles north of St. James.	-	-	4-21-87	19
Purgatory Creek	Minnesota River	Lat 44°53'04", long 93°28'41", in SW¼NW¼ sec.4, T.116 N., R.22 W., Hennepin County, Hydrologic Unit 07020012, at box culvert on County Road 4, in Eden Prairie.	-	-	7-24-87 7-28-87 7-29-87	696 52 35
Purgatory Creek	Minnesota River	Lat 44°51'38", long 93°26'56", in NW¼NE¼ sec.15, T.116 N., R.22 W., Hennepin County, Hydrologic Unit 07020012, at box culvert on State Highway 5, 1.6 miles above Staring Lake, 6.3 miles above mouth.	-	-	7-24-87 7-28-87 7-29-87	481 218 153
Purgatory Creek	Minnesota River	Lat 44°49'56", long 93°26'26", in NE¼NE¼ sec.27 T.116 N., R.22 W., Hennepin County, Hydrologic Unit 07020012, at box culvert on U.S. Highway 212/169, 0.45 mile below Staring Lake, 4 miles above mouth.	-	-	7-28-87 7-30-87	258 186
Purgatory Creek	Minnesota River	Lat 44°48'32", long 93°24'10", in NE¼SE¼ sec.36, T.116 N., R.22 W., Hennepin County, Hydrologic Unit 07020012, at triple culverts at Riverview Road in Eden Prairie.	-	-	7-24-87	444
Nine Mile Creek	Minnesota River	Lat 44°53'39", long 93°23'11", in SE¼SE¼ sec.31, T.117 N., R.21 W., Hennepin County, Hydrologic Unit 07020012, at pipe arch culvert at Gleason Road, in Edina, 0.5 mile north of U.S. Highway 169 and 212.	-	-	7-23-87	997

"See footnotes at end of table."

DISCHARGE AT PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

Discharge measurements made at miscellaneous sites during water year 1987--Continued

Stream	Tributary to	Location	Drainage area (mi^2)	Measured previously (water years)	Measurements Date	Measurements Discharge (ft^3/s)
		Minnesota River basin.--Continued				
Nine Mile Creek	Minnesota River	Lat 44°52'31", long 93°21'18" in NE¼NE¼ sec.9, T.116 N., R.21 W., Hennepin County, Hydrologic Unit 07020012, at pipe arch culvert at west 70th St. in Edina.	[a]6.28	-	7-23-87	770
South Fork Nine Mile Creek	Nine Mile Creek	Lat 44°53'53", long 93°26'07" in NW¼SW¼ sec.35, T.117 N., R.22 W., Hennepin County, Hydrologic Unit 07020012, at culvert on Rowland Road in Minnetonka, 0.9 mile above Bryant Lake.	-	-	7-23-87	234
South Fork Nine Mile Creek	Nine Mile Creek	Lat 44°52'25", long 93°25'00" in SE¼NE¼ sec.12, T.116 N., R.22 W., Hennepin County, Hydrologic Unit 07020012, at culvert on Bryant Lake Drive, below Bryant Lake in Eden Prairie.	-	-	7-24-87 7-29-97	61 50
Nine Mile Creek	Minnesota River	Lat 44°50'56", Long 93°21'00", in SW¼SW¼ sec.6, T.27 N., R.24 W., Hennepin County, Hydrologic Unit 07020012, at bridge on Normandale Blvd., in Bloomington, 6.8 miles above the mouth.	-	-	7-24-89 7-28-89 7-31-89	240 200 92
Nine Mile Creek	Minnesota River	Lat 44°48'58", long 93°18'42", in NE¼NE¼ sec.26, T.27 N., R.24 W., Hennepin County, Hydrologic Unit 07020012, at culvert under Old Shakopee Road, in Bloomington, 1.1 miles upstream of old gaging station 05330900, 3.1 miles upstream of mouth.	-	-	7-24-89 7-28-87 7-31-87	670 508 386
		Vadnais Lake basin				
Wilkinson Creek inlet	Wilkinson Lake	Lat 45°06'30", long 93°03'40" in NW¼NW¼ sec.9, T.30 N., R.22 W., Ramsey County, Hydrologic Unit 07010206, at culvert on County road J, 1300 ft west of Centerville Road in North Oaks, and 2200 ft upstream of Wilkinson Lake.	4.83	1984-85	5- 7-87 5-28-87 7-24-87 7-27-87	0.32 0.11 2.33 0.95
Lamberts Creek	Vadnais Lake	Lat 45°04'35", long 93°01'31", in NE¼NE¼ sec.22, T.30 N., R.22 W., Ramsey County, Hydrologic Unit 07010206, at site on stream in Ramaley Park on Dillon Street, 300 ft north of Whitaker Street in the City of White Bear Lake, 0.45 mile downstream of White Bear Lake.	1.07	1984-86	5- 7-87 5-28-87	0.08 0.07
East Branch Lamberts Creek	Lamberts Creek	Lat 45°03'53", long 93°03'27", in NE¼NW¼ sec.23, T.30 N., R.22 W., Ramsey County, Hydrologic Unit 07010206, at culvert on County Road F, 2.4 miles east of County Road 49 in Vadnais Heights, 2.1 miles downstream of White Bear Lake.	4.53	1984-86	5- 7-87 5-15-87 5-29-87 7-27-87 7-29-87 8- 5-87	0.33 0.99 0.38 3.39 5.27 0.86
Lamberts Creek	Vadnais Lake	Lat 45°04'14", long 93°02'31", Ramsey County, Hydrologic Unit 07010206, at culvert on Oakmede drive, 3 miles upstream from in Vadnais Lake in White Bear.	3.34	-	5- 8-87 7-24-87 7-27-87 7-29-87 8- 5-87	0.20 6.31 3.09 3.50 0.63
Lamberts Creek Inlet	Vadnais Lake	Lat 45°03'06", long 93°05'08", in SW¼SW¼ sec.29, T.30 N., R.22 W., Ramsey County, Hydrologic Unit 07010206, 200 ft above Lake Side road, 300 ft above Vadnais Lake, in Vadnais Heights.	7.53	1986	10-1-86 5- 6-87 5-15-87 5-19-87 5-29-87 7-24-87 7-25-87 7-27-87 7-29-87	5.72 0.74 0.80 0.72 0.37 29.1 16.5 7.36 10.2

"See footnotes at end of table."

DISCHARGE AT PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

Discharge measurements made at miscellaneous sites during water year 1987--Continued

Stream	Tributary to	Location	Drainage area (mi²)	Measured previously (water years)	Measurements	
					Date	Discharge (ft³/s)
		Mississippi River main stem				
Mississippi River	Gulf of Mexico	Lat 44°44'48", long 92°51'08", between secs.21 and 22, T. 115 N., Washington County line, Hydrologic Unit 07010206, at bridge on U.S. Highway 61, at Hastings, MN, 2.5 miles upstream from St. Croix River (05331580).	a37,100	1928, 1931-39, 1941-52, 1959-86	4- 8-87	16,600
St. Croix River	Mississippi River	Lat 44°44'57", long 92°48'16", in SE¼SE¼ sec.9, T.26 N., R.20 W., Pierce County, Hydrologic Unit 07030005, at bridge in Prescott, WI, 0.1 mile upstream from mouth (05344490).	a7,650	1928-30, 1932-39, 1947-48, 1950, 1953-57, 1959-86	4 8-87	4,990

† operated as high-flow partial record station
a approximately

LOW-FLOW INVESTIGATIONS

Low-flow Investigations in the South Fork Zumbro River Basin

Discharge measurements made for the Rochester ground water availability study to determine base flow variation which will facilitate modeling of ground-surface water relations. Base flow conditions for periods March 11-13 and Aug. 18 to 20 were fair-good measurements are condsidered base-flow. Total precipitation measured by the Rochester U.S. Weather Bureau observers for March 11-13 for 10 days preceding the measurements and including March 1-2 four inches of snow on ground, March 3 two inches snow on ground, March 4 one inch snow on ground, March 5-6 trace of snow on ground. For period Aug. 18-20 total precipitation of .10 inch on Aug. 9 and .84 inch on Aug. 16.

Discharge measurements made in Zumbro River basin, March 11-13 and August 18-20, 1987

Stream	Tributary	Location	Drainage area (mi^2)	Measured previously (water years)	Date	Discharge (ft^3/s)
South Fork Zumbro River	Zumbro River	Lat 43°55'58", long 92°33'28", in NE¼NE¼ sec.1, T.105 N., R.15 W., Olmsted County, Hydrologic Unit 07040004, at culvert on County Road 104, 6.9 miles upstream of Mayowood Lake dam southwest of Rochester.	-	1987	3-12-87 8-18-87	28 10
Unnamed tributary	South Fork Zumbro River	Lat 43°55'56", long 92°33'26", in NW¼NW¼ sec.6, T.105 N., R.14 W., Olmsted County, Hydrologic Unit 07040004, in stream adjacent to County Road 104, 6.9 miles upstream of Mayowood Lake dam, southwest of Rochester.	-	1987	3-12-87 8-18-87	1.13 .14
Unnamed tributary	South Fork Zumbro River	Lat 43°56'03", long 92°33'05", in NE¼NW¼ sec.6, T.105 N., R.14 W., Olmsted County, Hydrologic Unit 07040004, in stream, 0.3 mile east of County Road 104, 6.6 miles upstream of Mayowood Lake dam, southwest of Rochester.	-	1987	3-12-87 8-18-87	2.52 .67
Unnamed tributary	South Fork Zumbro River	Lat 43°56'03", long 92°32'59", in NE¼NW¼ sec.6, T.105 N., R.14 W., Olmsted County, Hydrologic Unit 07040004, in stream, 6.5 miles upstream of Mayowood Lake dam, southwest of Rochester.	-	1987	3-12-87	0.2
Unnamed tributary	South Fork Zumbro River	Lat 43°56'12", long 92°33'28", in SW¼SW¼ sec.31, T.106 N., R.14 W., Olmsted County, Hydrologic Unit 07040004, at culvert on County Road 104, 5.1 miles upstream of Mayowood Lake dam, southwest of Rochester.	-	1987	3-12-87 8-18-87	Dry Dry
Unnamed tributary	South Fork Zumbro River	Lat 43°56'59", long 92°32'52", in SE¼SW¼ sec.30, T.106 N., R.14 W., Olmsted County, Hydrologic Unit 07040004, at culvert on township road, 5.4 miles upstream of Mayowood Lake dam, southwest of Rochester.	-	1987	3-12-87 8-18-87	0.25 Dry
Unnamed tributary	South Fork Zumbro River	Lat 43°56'21", long 92°33'28", in NW¼SW¼ sec.31, T.106 N., R.14 W., Olmsted County, Hydrologic Unit 07040004, at culvert on County Road 104, 5.9 miles upstream of Mayowood Lake dam, southwest of Rochester.	-	1987	3-12-87 8-18-87	Dry Dry
Unnamed tributary	South Fork Zumbro River	Lat 43°57'19", long 92°32'28", in NE¼SW¼ sec.30, T.106 N., R.14 W., Olmsted County, Hydrologic Unit 07040004, at culvert on township road, 5.5 miles upstream of Mayowood Lake dam, southwest of Rochester.	-	1987	3-12-87 8-18-87	Dry Dry

Discharge measurements made in Zumbro River basin, March 11-13 and August 18-20, 1987.--Continued

Stream	Tributary	Location	Drainage area (mi^2)	Measured previously (water years)	Date	Discharge (ft^3/s)
South Fork Zumbro River	Zumbro River	Lat 43°57'24", long 92°33'32", in NE¼SE¼ sec.25, T.106 N., R.15 W., Olmsted County, Hydrologic Unit 07040004, at bridge on township road 0.1 mile east of County Road 104, 4.6 miles upstream of Mayowood Lake dam.	-	1987	3-12-87 8-18-87	32 8.11
Unnamed tributary	South Fork Zumbro River	Lat 43°57'41", long 92°33'29", in NE¼NE¼ sec.25, T.106 N., R.15 W., Olmsted County, Hydrologic Unit 07040004, at culvert on County Road 104, 4.5 miles upstream of Mayowood Lake dam, southwest of Rochester.	-	1987	3-12-87 8-18-87	0.2 Dry
Unnamed tributary	South Fork Zumbro River	Lat 43°57'24", long 92°34'24", in SW¼NW¼ sec.25, T.106 N., R.15 W., Olmsted County, Hydrologic Unit 07040004, at culvert on township road, 4.6 miles upstream of Mayowood dam, southwest of Rochester.	-	1987	3-12-87 8-18-87	0.2 Dry
Unnamed intermittent tributary	Unnamed intermittent tributary	Lat 43°57'24", long 92°34'24", in SW¼NW¼ sec.25, T.106 N., R.15 W., Olmsted County, Hydrologic Unit 07040004, at culvert on County Road 15, 4.5 miles upstream of Mayowood Lake dam, southwest of Rochester.	-	1987	3-12-88 8-18-88	Dry Dry
Unnamed intermittent tributary	Unnamed intermittent tributary	Lat 43°57'24", long 92°33'58", in SW¼NE¼ sec.25, T.106 N., R.15 W., Olmsted County, Hydrologic Unit 07040004, at culvert on township road, 4.6 miles upstream of Mayowood Lake dam, southwest of Rochester.	-	-	3-12-87 8-18-87	Dry Dry
Unnamed intermittant tributary	South Fork Zumbro River	Lat 43°58'11", long 92°34'20", in NE¼SW¼ sec.24, T.106 N., R.15 W., Olmsted County, Hydrologic Unit 07040004, at culvert on County Road 15, 3.9 miles upstream of Mayowood Lake dam, southwest of Rochester.	-	1987	3-12-87 8-18-87	Dry Dry
[a] Salem Creek	South Fork Zumbro River	Lat 43°58'45", long 92°34'04", in SE¼NW¼ sec.24, T.106 N., R.15 W., Olmsted County, Hydrologic Unit 07040004, on County Road 15, 5.9 miles southwest of Rochester, 3.5 miles south of U.S. Highway 14 (05372700).	-	1985, 1987	3-12-87 8-18-87	19 6.73
Unnamed intermittent tributary	South Fork Zumbro River	Lat 43°58'44", long 92°34'04", in SE¼SW¼ sec.13, T.106 N., R.15 W., Olmsted County, Hydrologic Unit 07040004, at culvert on County Road 15, miles upstream of Mayowood Lake, southwest of Rochester.	-	1987	3-12-87 8-18-87	Dry Dry
Unnamed intermittent tributary	South Fork Zumbro River	Lat 43°59'08", long 92°33'56", in SW¼NE¼ sec.13, T.106 N., R.15 W., Olmsted County, Hydrologic Unit 07040004, at culvert on State Highway 25, 3 miles upstream of Mayowood Lake dam, southwest of Rochester.	-	1987	3-12-87 8-18-87	0.2 Dry
Unnamed intermittent tributary	Unnamed intermittent tributary	Lat 43°59'00", long 92°34'04", in NW¼SE¼ sec.13, T.106 N., R.15 W., Olmsted County, Hydrologic Unit 07040004, at culvert on County Road 15, 3 miles upstream of Mayowood Lake dam, southwest of Rochester.	-	1987	3-12-87 8-18-87	Dry Dry

Discharge measurements made in Zumbro River basin, March 11-13 and August 18-20, 1987.--Continued

Stream	Tributary	Location	Drainage area (mi^2)	Measured previously (water years)	Date	Discharge (ft^3/s)
South Fork Zumbro River	Zumbro River	Lat 43°58'45", long 92°33'28", in SW¼SW¼ sec.18, T.106 N., R.14 W., Olmsted County, Hydrologic Unit 07040004, at bridge on County Road 104, 2.6 miles upstream from Mayowood Lake dam, and 5.2 miles southwest of Rochester.	-	1968-69, 1987	3-12-87 8-18-87	54 17
Unnamed intermittent tributary	South Fork Zumbro River	Lat 43°57'50", long 92°32'18", in SE¼SE¼ sec.19, T.106 N., R.14 W., Olmsted County, Hydrologic Unit 07040004, at culvert on County Road 117, 3.6 miles upstream of Mayowood Lake dam, southwest of Rochester.	-	1987	3-12-87 8-18-87	Dry Dry
Unnamed intermittant tributary	South Fork Zumbro River	Lat 43°59'47", long 92°32'51", in SW¼SE¼ sec.7, T.106 N., R.14 W., Olmsted County, Hydrologic Unit 07040004, at culvert on State Highway 25, 1.7 miles upstream of Mayowood Lake dam, southwest of Rochester.	-	1987	3-12-87 8-18-87	Dry Dry
Unnamed intermittant tributary	South Fork Zumbro River	Lat 43°59'50", long 92°32'10", in NW¼SW¼ sec.8, T.106 N., R.14 W., Olmsted County, Hydrologic Unit 07040004, at culvert on State Highway 25, 1.3 miles upstream of Mayowood Lake dam, southwest of Rochester.	-	1987	3-12-87 8-18-87	Dry Dry
South Fork Zumbro River	Zumbro River	Lat 43°59'40", long 92°31'13", in SE¼SE¼ sec.8, T.106 N., R.14 W., Olmsted County, Hydrologic Unit 07040004, at bridge on County Road 125, at outlet of Mayowood Lake, 3.2 miles southwest of Rochester.	-	1971, 1987	3-12-87 8-18-87	58 23
Bamber Valley Creek	South Fork Zumbro River	Lat 43°59'34", long 92°30'11", in SE¼SE¼ sec.9, T.106 N., R.14 W., Olmsted County, Hydrologic Unit 07040004, at culvert on County Road 125, 0.4 mile upstream of Bamber Lake at Bamber Valley School southwest of Rochester.	-	1987	3-12-87 8-18-87	Dry Dry
South Fork Zumbro River	Zumbro River	Lat 43°59'51", long 92°29'51", in NW¼SW¼ sec.10, T.106 N., R.14 W., Olmsted County, Hydrologic Unit 07040004, at bridge on State Highway 8, 0.2 mile upstream of Lake George, southwest of Rochester.	-	1987	3-12-87	66
South Fork Zumbro River	Zumbro River	Lat 44°00'26", long 92°28'19", in SE¼SW¼ sec.2, T.106 N., R.14 W., Olmsted County, Hydrologic Unit 07040004, on downstream side of westbound lane bridge of U.S. Highway 14 at Rochester, 1.5 miles upstream from Bear Creek (05372800).	155	1965, 1968-83+, 1987	3-12-87	68
South Fork Zumbro River	Zumbro River	Lat 44°01'09", long 92°27'42", in NE¼NE¼ sec.2, T.106 N., R.14 W., Olmsted County, Hydrologic Unit 07040004, at bridge on 4th Street SW, near Mayo Park in Rochester.	-	1978	3-12-87	65
Bear Creek	South Fork Zumbro River	Lat 43°59'09", long 92°20'43", in SE¼NE¼ sec.14, T.106 N., R.13 W., Olmsted County, Hydrologic Unit 07040004, at bridge on County Highway 19, 0.1 mile north of County Road 143, east of Rochester.	-	1987	8-20-87	0.85

Discharge measurements made in Zumbro River basin, March 11-13 and August 18-20, 1987.--Continued

Stream	Tributary	Location	Drainage area (mi^2)	Measured previously (water years)	Date	Discharge (ft^3/s)
Unnamed intermittent tributary	Bear Creek	Lat 43°59'07", long 92°20'43", in SW¼NE¼ sec.14, T.106 N., R.13 W., Olmsted County, Hydrologic Unit 07040004, at culvert on County Road 143, 0.1 mile west of County Highway 19, east of Rochester.	-	1987	8-20-87	Dry
Unnamed intermittent tributary	Bear Creek	Lat 43°59'10", long 92°20'54", in SW¼NE¼ sec.14, T.106 N., R.13 W., Olmsted County, Hydrologic Unit 07040004, at culvert on County Road 143, 0.2 mile west of County Highway 19, east of Rochester.	-	1987	8-20-87	Dry
Unnamed intermittent tributary	Bear Creek	Lat 43°59'12", long 92°21'00", in SE¼NW¼ sec.14, T.106 N., R.13 W., Olmsted County, Hydrologic Unit 07040004, at culvert on County Road 143, 0.3 mile west of County Highway 19, east of Rochester.	-	1987	8-20-87	Dry
Unnamed intermittent tributary	Bear Creek	Lat 43°59'28", long 92°21'46", in NE¼NE¼ sec.15, T.106 N., R.13 W., Olmsted County, Hydrologic Unit 07040004, at culvert on County Road 143, 1 mile west of County Highway 19, east of Rochester.	-	1987	8-20-87	Dry
Bear Creek	South Fork Zumbro River	Lat 43°59'54", long 92°22'43", in NE¼SW¼ sec.9, T.106 N., R.13 W., Olmsted County, Hydrologic Unit 07040004, at bridge on 50th Avenue S.E. (County Highway 11), 2.7 miles north of U.S. Highway 52 east of Rochester.	-	1987	3-13-87 8-19-87	12 2.89
Unnamed intermittent tributary	Bear Creek	Lat 44°00'10", long 92°22'44", in SE¼NE¼ sec.9, T.106 N., R.13 W., Olmsted County, Hydrologic Unit 07040004, at culvert on County Highway 11, 0.5 mile south U.S. Highway 14, southeast of Rochester.	-	1987	3-12-87 8-19-87	2.29 2.20
Unnamed intermittent tributary	Bear Creek	Lat 43°59'33", long 92°23'19", in SW¼SE¼ sec.9, T.106 N., R.13 W., Olmsted County, Hydrologic Unit 07040004, at culvert on County Road 143, 0.5 mile west of County Highway 11 east of Rochester.	-	1987	8-19-87	Dry
Bear Creek	South Fork Zumbro River	Lat 43°59'27", long 92°25'10", in NE¼NE¼ sec.18, T.106 N., R.13 W., Olmsted County, Hydrologic Unit 07040004, at bridge on 30th Avenue southeast, 0.3 mile north of KOLM radio tower, east of Rochester.	-	1987	3-13-87 8-13-87	21 9.86
Unnamed intermittent tributary	Bear Creek	Lat 43°59'41", long 92°25'32", in SW¼SE¼ sec.7, T.106 N., R.13 W., Olmsted County, Hydrologic Unit 07040004, at culvert on Marion Road SE (U.S. Highway 52), at Marvale Ave. southeast of Rochester.	-	1987	3-12-87 8-20-87	Dry Dry
Badger Run Creek	Bear Creek	Lat 43°59'14", long 92°25'08", in SE¼NE¼ sec.18, T.106 N., R.13 W., Olmsted County, Hydrologic Unit 07040004, at culvert on 30th Avenue southeast, 0.1 mile northeast of KOLM radio tower east of Rochester.	-	1987	3-13-87 8-20-87	6.38 3.29

Discharge measurements made in Zumbro River basin, March 11-13 and August 18-20, 1987.--Continued

Stream	Tributary	Location	Drainage area (mi^2)	Measured previously (water years)	Date	Discharge (ft^3/s)
Badger Run Creek	Bear Creek	Lat 43°59'27", long 92°26'04", in NW¼NW¼ sec.18, T.106 N., R.14 W., Olmsted County, Hydrologic Unit 07040004, in stream .15 mile north of Pinewood Road S.E., .75 mile west 30th Avenue S.E., southeast of Rochester.	-	1987	3-13-87 8-20-87	6.88 3.50
Willow Creek	Bear Creek	Lat 43°59'26", long 92°26'31", in NE¼NE¼ sec.13, T.106 N., R.14 W., Olmstead County, Hydrologic Unit 07040004, at culvert on Simpson Road S.E. (County Highway 1), southeast of Rochester.	-	1987	3-13-87 8-20-87	14 4.31
Bear Creek	South Fork Zumbro River	Lat 44°00'29", long 92°26'44", in SW¼SE¼ sec.1, T.106 N., R.14 W., Olmsted County, Hydrologic Unit 07040004, at left bank on downstream side of west-bound lane bridge of U.S. Highway 14 at Rochester, 1.2 miles above mouth (05372930).	80	1965, 1968-83+, 1987	3-12-87 8-19-87	43 22
Unnamed intermittent tributary	Bear Creek	Lat 44°01'05", long 92°27'03", in NE¼NW¼ sec.1, T.106 N., R.14 W., Olmsted County, Hydrologic Unit 07040004, at culvert on 9th Street S.E. 1 block south of 4th Street S.E. in Rochester.	-	1987	3-11-87 8-19-87	0.51 0.23
Bear Creek	South Fork Zumbro River	Lat 44°01'09", long 92°27'20", in NW¼NW¼ sec.1, T.106 N., R.14 W., Olmsted County, Hydrologic Unit 07040004, at bridge on 4th Street S.E. in Rochester.	-	1987	3-12-87 8-19-87	44 23
Silver Creek	South Fork Zumbro River	Lat 44°01'44", long 92°25'44", in center of sec.31, T.107 N., R.13 W., Olmsted County, Hydrologic Unit 07040004, at bridge on Silver Creek Road N.E., 0.5 mile north of College View Road east (County Road 9) east of Rochester 1.7 miles upstream from mouth (05372950).	17.3	1968-83+, 1987	3-13-87 8-20-87	4.15 .57
Silver Creek	South Fork Zumbro River	Lat 44°01'46", long 92°26'55", in SW¼NE¼ sec.36, T.107 N., R.14 W., Olmsted County, Hydrologic Unit 07040004, at bridge on 11th Avenue N.E., in Rochester.	-	1987	3-11-87 8-20-87	7.19 1.35
Cascade Creek	South Fork Zumbro River	Lat 44°00'04", long 92°36'29", in SW¼NE¼ sec.10, T.106 N., R.15 W., Olmsted County, Hydrologic Unit 07040004, at culvert on County Highway 3, 3.5 miles southwest of KROC-TV radio tower west of Rochester.	-	1987	3-12-87 8-19-87	2.95 1.40
Unnamed intermittent tributary	Cascade Creek	Lat 44°00'04", long 92°36'29", in SW¼NE¼ sec.10, T.106 N., R.15 W., Olmsted County, Hydrologic Unit 07040004, at culvert on County Highway 3, 3.5 miles southwest of KROC-TV radio tower west of Rochester.	-	1987	3-12-87 8-19-87	Dry Dry
Unnamed intermittent tributary	Cascade Creek	Lat 44°00'26", long 92°35'36", in NE¼NW¼ sec.11, T.106 N., R.15 W., Olmsted County, Hydrologic Unit 07040004, at culvert on township road, 2.7 miles southwest of KROC-TV radio tower west of Rochester.	-	1987	8-19-87	0.3

Discharge measurements made in Zumbro River basin, March 11-13 and August 18-20, 1987.--Continued

Stream	Tributary	Location	Drainage area (mi^2)	Measured previously (water years)	Date	Discharge (ft^3/s)
Cascade Creek	South Fork Zumbro River	Lat 44°00'19", long 92°34'40", in NW¼NW¼ sec.12, T.106 N., R.15 W., Olmsted County, Hydrologic Unit 07040004, at culvert on township road, 2.1 miles southwest of KROC-TV radio tower west of Rochester.	-	1987	3-12-87 8-19-87	4.29 1.70
Unnamed intermittent tributary	Cascade Creek	Lat 44°00'27", long 92°34'40", in NW¼NW¼ sec.12, T.106 N., R.14 W., Olmsted County, Hydrologic Unit 07040004, at culvert at township road, 1.9 miles southwest of KROC-TV radio tower west of Rochester.	-	1987	3-12-87 8-18-87	Dry Dry
Unnamed intermittent tributary	Cascade Creek	Lat 44°00'26", long 92°34'14", in NE¼NW¼ sec.12, T.106 N., R.15 W., Olmsted County, Hydrologic Unit 07040004, at culvert on township road, 1.7 miles southwest of KROC-TV radio tower west of Rochester.	-	1987	3-12-87 8-18-87	Dry Dry
Unnamed intermittent tributary	Cascade Creek	Lat 44°00'28", long 92°33'38", in SE¼SE¼ sec.3, T.106 N., R.14 W., Olmsted County, Hydrologic Unit 07040004, in stream 0.1 mile east of County Road 104, .05 mile north of township road, 1.4 miles southwest of KROC-TV radio tower west of Rochester.	-	1987	3-12-87 8-18-87	Dry Dry
Cascade Creek	South Fork Zumbro River	Lat 44°00'52", long 92°33'28", in SW¼NW¼ sec.6, T.106 N., R.14 W., Olmsted County, Hydrologic Unit 07040004, at culvert under farm drive, 0.9 mile southwest of KROC-TV radio tower west of Rochester.	-	1987	3-12-87 8-19-87	4.95 1.67
Unnamed intermittent tributary	Cascade Creek	Lat 44°01'00", long 92°31'58", in SE¼NW¼ sec.5, T.106 N., R.14 W., Olmsted County, Hydrologic Unit 07040004, in stream next to township road, 0.4 mile south of County Highway 34, 0.8 mile southeast of KROC-TV radio tower west of Rochester.	-	1987	3-12-87 8-18-87	Dry Dry
Cascade Creek	South Fork Zumbro River	Lat 44°01'02", long 92°01'52", in SE¼NW¼ sec.5, T.106 N., R.14 W., Olmsted County, Hydrologic Unit 07040004, at culvert on township Road, 0.3 mile south of County Highway 34, 0.8 mile southeast of KROC-TV radio tower west of Rochester.	-	1987	8-19-88	1.12
Unnamed intermittent tributary	Cascade Creek	Lat 44°01'18", long 92°31'54", in NE¼NW¼ sec.5, T.106 N., R.14 W., Olmsted County, Hydrologic Unit 07040004, at culvert under County Highway 34, 0.7 mile southeast of KROC-TV radio tower west of Rochester.	-	1987	3-12-87 8-19-87	Dry Dry
Cascade Creek	South Fork Zumbro River	Lat 44°01'15", long 92°30'58", in NW¼NW¼ sec.4, T.106 N., R.14 W., Olmsted County, Hydrologic Unit 07040004, at culvert on County Highway 34, 1.4 miles east of KROC-TV radio tower west of Rochester.	-	1967, 1987	3-12-87 8-19-87	4.84 1.16
Unnamed intermittent tributary	Cascade Creek	Lat 44°02'03", long 92°30'33", in NE¼NW¼ sec.0, T.107 N., R.14 W., Olmsted County, Hydrologic Unit 07040004, at culvert on township road, 0.2 mile west of U.S. Highway 14, 1.9 miles northeast of KROC-TV radio tower west of Rochester.	-	1987	3-12-87 8-19-87	2.51 .20

Discharge measurements made in Zumbro River basin, March 11-13 and August 18-20, 1987.--Continued

Stream	Tributary	Location	Drainage area (mi^2)	Measured previously (water years)	Date	Discharge (ft^3/s)
Cascade Creek	South Fork Zumbro River	Lat 44°01'41", long 92°29'03", in NE¼SE¼ sec.34, T.107 N., R.14 W., Olmsted County, Hydrologic Unit 07040004, at bridge on 16th Street N.W., in Rochester.	-	1967, 1980-83+, 1987	3-11-87	16
Cascade Creek	South Fork Zumbro River	Lat 44°02'10", long 92°28'02", in NW¼NE¼ sec.35, T.107 N., R.14 W., Olmsted County, Hydrologic Unit 07040004, at bridge on 14th Street N.W., in Rochester.	-	1987	3-11-87	16
South Fork Zumbro River	Zumbro River	Lat 44°02'35", long 92°27'53", in SW¼SE¼ sec.26, T.107 N., R.14 W., Olmsted County, Hydrologic Unit 07040004, at bridge on Elton Hills Drive, 0.4 mile downstream of Silver Lake, in Rochester.	-	1987	3-11-87	148
Unnamed intermittent tributary	South Fork Zumbro River	Lat 44°04'14", long 92°27'30", in NE¼SE¼ sec.14, T.107 N., R.14 W., Olmsted County, Hydrologic Unit 07040004, at culvert on township road, 0.7 mile north of County Highway 22, north of Rochester.	-	1987	3-12-87 8-20-87	1.0 Dry
South Fork Zumbro River	Zumbro River	Lat 44°04'42", long 92°28'09", in NE¼NW¼ sec.14, T.107 N., R.14 W., Olmsted County, Hydrologic Unit 07040004, in stream next to County Road 133, 1.3 miles north of County Highway 22 north of Rochester.	-	1987	3-12-87 8-20-87	158 75
Unnamed tributary	South Fork Zumbro River	Lat 44°04'48", long 92°28'28", in NW¼NW¼ sec.14, T.107 N., R.14 W., Olmsted County, Hydrologic Unit 07040004, at culvert on County Road 133, north of Rochester.	-	1987	3-11-87 8-20-87	1.66 .63
Unnamed intermittent tributary	Unnamed tributary	Lat 44°04'55", long 92°28'29", in SW¼SW¼ sec.11, T.107 N., R.14 W., Olmsted County, Hydrologic Unit 07040004, at culvert on County Road 133, north of Rochester.	-	1987	3-11-87 8-20-87	Dry Dry
South Fork Zumbro River	Zumbro River	Lat 44°05'04", long 92°27'22", in NW¼SW¼ sec.12, T.107 N., R.14 W., Olmsted County, Hydrologic Unit 07040004, at old dam north of trailer park, north of Rochester.	-	1987	3-11-87 8-20-87	180 77
Unnamed intermittent tributary	South Fork Zumbro River	Lat 44°05'55", long 92°26'13", in NW¼SW¼ sec.6, T.107 N., R.13 W., Olmsted County, Hydrologic Unit 07040004, at culvert on U.S. Highway 63, north of Rochester.	-	1987	3-11-87 8-20-87	Dry Dry
Unnamed intermittent tributary	South Fork Zumbro River	Lat 44°06'21", long 92°25'58", in NE¼NW¼ sec.6, T.107 N., R.13 W., Olmsted County, Hydrologic Unit 07040004, at culvert on U.S. Highway 63.	-	1987	3-11-87 8-20-87	Dry Dry
South Fork Zumbro River	Zumbro River	Lat 44°06'29", long 92°26'50", in NW¼NE¼ sec.1, T.107 N. R.14 W., Olmsted County, Hydrologic Unit 07040004, downstream of bridge on County Highway 14, north of Rochester.	-	1987	3-11-87 8-20-87	206 91
Unnamed intermittent tributary	South Fork Zumbro River	Lat 44°07'01", long 92°26'18", in SE¼NE¼ sec.36, T.108 N., R.14 W., Olmsted County, Hydrologic Unit 07040004, at culvert on township road, 0.6 mile north of County Highway 14, north of Rochester.	-	1987	3-11-87 8-20-87	Dry Dry

Discharge measurements made in Zumbro River basin, March 11-13 and August 18-20, 1987.--Continued

Stream	Tributary	Location	Drainage area (mi^2)	Measured previously (water years)	Date	Discharge (ft^3/s)
Unnamed intermittent tributary	South Fork Zumbro River	Lat 44°06'29", long 92°27'45", in SE¼SE¼ sec.35, T.108 N., R.14 W., Olmsted County, Hydrologic Unit 07040004, at culvert on County Highway 14, north of Rochester.	-	1987	3-11-87 8-20-87	Dry Dry
Unnamed intermittent tributary	South Fork Zumbro River	Lat 44°06'41", long 92°28'42", in SW¼SW¼ sec.35, T.108 N., R.14 W., Olmsted County, Hydrologic Unit 07040004, at culvert on township road, 0.2 mile north of County Highway 14, north of Rochester.	-	1987	3-11-87 8-20-87	Dry Dry
Unnamed intermittent tributary	Unnamed intermittent tributary	Lat 44°07'07", long 92°28'42", in SW¼NW¼ sec.35, T.108 N., R.14 W., Olmsted County, Hydrologic Unit 07040004, at culvert on township road, 0.7 mile north of County Highway 14, north of Rochester.	-	1987	3-11-87 8-20-87	Dry Dry
South Fork Zumbro River	Zumbro River	Lat 44°07'47", long 92°27'44", in SE¼NE¼ sec.26, T.108 N., R.14 W., Olmsted County, Hydrologic Unit 07040004, at abandoned bridge on township road, 2 miles north of County Highway 14, north of Rochester.	-	1987	3-11-87 8-20-87	204 98

+ Operated as High-Flow Partial Record station.
a U.S. Weather Bureau wire weight gage at site.

MISCELLANEOUS WATER QUALITY DATA COLLECTED AT CONTINUOUS-RECORD STATIONS

WATER QUALITY DATA AT STREAMFLOW STATIONS

Field determinations of water temperature and specific conductance are made at many streamflow stations in addition to those that are also regular water-quality stations. These data are usually collected at regular intervals during routine visits to the station. Additional data for each station are published elsewhere in this report.

WATER QUALITY DATA AT STREAMFLOW STATIONS, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

05200445 MISSISSIPPI RIVER AT BEMIDJI, MN

DATE	MEASURED DISCHARGE (ft^3/s)	TEMPERATURE (°C)	SPECIFIC CONDUCTANCE (MICROMHOS)	DATE	MEASURED DISCHARGE (ft^3/s)	TEMPERATURE (°C)	SPECIFIC CONDUCTANCE (MICROMHOS)
JUNE 01, 1987	414	---	---	AUG. 10	269	22.0	---
JUNE 16	105	---	---	SEPT. 03	121	16.0	---
JULY 01	54	---	---				

05211000 MISSISSIPPI RIVER AT GRAND RAPIDS, MN

DATE	MEASURED DISCHARGE (ft^3/s)	TEMPERATURE (°C)	SPECIFIC CONDUCTANCE (MICROMHOS)	DATE	MEASURED DISCHARGE (ft^3/s)	TEMPERATURE (°C)	SPECIFIC CONDUCTANCE (MICROMHOS)
OCT. 21, 1986	2,140	---	---	MAY 27	1,650	---	---
NOV. 24	1,790	1.0	---	JUNE 05	1,660	20.0	---
JAN. 07, 1987	1,910	---	---	JUNE 11	1,340	---	---
FEB. 17	1,700	1.0	250	JULY 28	1,430	26.0	---
MAR. 04	1,090	1.5	290	AUG. 03	1,140	---	---
MAR. 30	1,050	3.5	230	AUG. 25	1,140	---	---
APR. 24	261	5.0	350	SEPT. 17	992	18.0	---
MAY 08	182	19.0	270	SEPT. 25	1,950	17.0	---

05216860 SWAN RIVER NEAR CALUMET, MN

DATE	MEASURED DISCHARGE (ft^3/s)	TEMPERATURE (°C)	SPECIFIC CONDUCTANCE (MICROMHOS)	DATE	MEASURED DISCHARGE (ft^3/s)	TEMPERATURE (°C)	SPECIFIC CONDUCTANCE (MICROMHOS)
OCT. 21, 1986	47	9.5	270	MAY 11	32	15.0	260
DEC. 01	52	0.5	---	JULY 10	16	26.0	---
JAN. 13, 1987	30	0.5	280	AUG. 17	65	21.0	---
FEB. 23	26	---	---	SEPT. 25	38	---	---
APR. 09	79	---	---				

05227500 MISSISSIPPI RIVER AT AITKIN, MN

DATE	MEASURED DISCHARGE (ft^3/s)	TEMPERATURE (°C)	SPECIFIC CONDUCTANCE (MICROMHOS)	DATE	MEASURED DISCHARGE (ft^3/s)	TEMPERATURE (°C)	SPECIFIC CONDUCTANCE (MICROMHOS)
OCT. 16, 1986	4,660	7.5	215	MAY 19	1,250	---	---
DEC. 11	2,830	.0	---	JUNE 23	1,660	---	---
JAN. 16, 1987	2,450	.0	---	AUG. 12	2,040	---	---
FEB. 19	2,110	.0	---	SEPT. 14	1,370	17.0	---
APR. 01	2,770	1.5	---				

05243721 STRAIGHT RIVER AT COUNTY HIGHWAY 125 NEAR OSAGE, MN

DATE	MEASURED DISCHARGE (ft^3/s)	TEMPERATURE (°C)	SPECIFIC CONDUCTANCE (MICROMHOS)	DATE	MEASURED DISCHARGE (ft^3/s)	TEMPERATURE (°C)	SPECIFIC CONDUCTANCE (MICROMHOS)
NOV. 06, 1986	50	---	---	JULY 16	35	17.0	350
MAR. 12, 1987	49	2.0	385	AUG. 06	35	21.0	359
APR. 14	45	---	---	AUG. 27	37	13.5	360
APR. 27	41	12.0	420	SEPT. 24	40	11.0	380
JUNE 09	40	18.0	386				

WATER QUALITY DATA AT STREAMFLOW STATIONS, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	MEASURED DISCHARGE (ft^3/s)	TEMPERA-TURE (°C)	SPECIFIC CONDUC-TANCE (MICRO-MHOS)	DATE	MEASURED DISCHARGE (ft^3/s)	TEMPERA-TURE (°C)	SPECIFIC CONDUC-TANCE (MICRO-MHOS)
05243723 STRAIGHT RIVER AT COUNTY HIGHWAY 115 NEAR PARK RAPIDS, MN							
NOV. 05, 1986	64	---	---	JUNE 10	54	14.5	405
MAR. 12, 1987	67	3.0	395	JULY 16	53	20.0	370
MAR. 13	63	---	---	AUG. 06	37	21.0	378
APR. 15	60	---	---	AUG. 27	45	14.5	380
APR. 28	54	9.5	435	SEPT. 24	55	11.0	400
05243725 STRAIGHT RIVER AT U.S. HIGHWAY 71 NEAR PARK RAPIDS, MN							
NOV. 05, 1986	74	---	---	JUNE 10	67	15.0	410
NOV. 06	79	---	---	JULY 16	57	23.0	365
MAR. 12, 1987	78	3.5	405	JULY 17	62	20.5	365
MAR. 13	69	---	---	AUG. 07	55	19.0	388
APR. 15	65	---	---	AUG. 27	51	16.0	295
APR. 28	61	14.5	445	SEPT. 24	59	12.0	400
05245100 LONG PRAIRIE RIVER AT LONG PRAIRIE, MN							
OCT. 02, 1986	720	14.5	490	MAY 19	166	16.0	420
DEC. 05	329	.0	410	JUNE 01	444	22.5	430
JAN. 28, 1987	192	.0	440	JULY 21	101	23.0	---
MAR. 31	383	3.0	430	SEPT. 08	52	18.5	---
05247500 CROW WING RIVER NEAR PILLAGER, MN							
OCT. 21, 1986	2,150	10.0	350	MAY 07	1,260	17.5	---
JAN. 21, 1987	1,050	.0	---	JUNE 17	1,050	24.0	---
MAR. 19	1,480	1.0	370	AUG. 05	744	---	---
05267000 MISSISSIPPI RIVER NEAR ROYALTON, MN							
DEC. 17, 1986	5,360	.5	312	SEPT. 22	3,480	16.2	291
MAY 08, 1987	2,880	18.0	331				
05275000 ELK RIVER NEAR BIG LAKE, MN							
NOV. 13, 1986	329	.0	290	MAY 28	196	---	---
JAN. 05, 1987	222	.0	380	AUG. 13	152	20.5	270
FEB. 25	196	.5	350	SEPT. 14	73	17.5	300
MAR. 20	218	8.0	---				
05278000 MIDDLE FORK CROW RIVER NEAR SPICER, MN							
OCT. 27, 1986	255	11.5	410	MAY 19	43	18.0	390
DEC. 05	145	2.0	420	JULY 16	43	22.5	---
JAN. 28, 1987	79	1.0	460	SEPT. 08	10	17.0	---
MAR. 31	128	3.0	410				

WATER QUALITY DATA AT STREAMFLOW STATIONS, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

05280000 CROW RIVER AT ROCKFORD, MN

DATE	MEASURED DISCHARGE (ft^3/s)	TEMPERA-TURE (°C)	SPECIFIC CONDUC-TANCE (MICRO-MHOS)	DATE	MEASURED DISCHARGE (ft^3/s)	TEMPERA-TURE (°C)	SPECIFIC CONDUC-TANCE (MICRO-MHOS)
OCT. 28, 1986	2,160	11.0	---	APR. 28	608	---	---
NOV. 24	1,240	.0	645	MAY 26	564	19.0	---
DEC. 29	636	.0	600	JUNE 29	540	23.0	---
JAN. 26, 1987	373	.0	720	JULY 29	784	27.0	540
FEB. 23	408	---	---	AUG. 27	269	---	---
MAR. 26	832	8.0	---	SEPT. 25	175	16.0	---

05286000 RUM RIVER NEAR ST. FRANCIS, MN

DATE	MEASURED DISCHARGE (ft^3/s)	TEMPERA-TURE (°C)	SPECIFIC CONDUC-TANCE (MICRO-MHOS)	DATE	MEASURED DISCHARGE (ft^3/s)	TEMPERA-TURE (°C)	SPECIFIC CONDUC-TANCE (MICRO-MHOS)
DEC. 02, 1986	925	.0	---	MAY 29	791	---	---
JAN. 14, 1987	668	.0	---	AUG. 07	212	---	---
FEB. 25,	577	.0	265	AUG. 10	185	24.0	290
APR. 06	694	8.0	235	SEPT. 01	192	22.0	---

05287890 ELM CREEK NEAR CHAMPLIN, MN

DATE	MEASURED DISCHARGE (ft^3/s)	TEMPERA-TURE (°C)	SPECIFIC CONDUC-TANCE (MICRO-MHOS)	DATE	MEASURED DISCHARGE (ft^3/s)	TEMPERA-TURE (°C)	SPECIFIC CONDUC-TANCE (MICRO-MHOS)
OCT. 21, 1986	33	10.0	---	APR. 02	6.02	4.5	600
NOV. 28	12	1.5	---	JUNE 01	3.34	20.0	---
JAN. 08, 1987	5.48	.0	660	JULY 24	8.89	21.0	---
FEB. 20	4.32	2.0	655	SEPT. 17	3.08	14.5	---

05288500 MISSISSIPPI RIVER NEAR ANOKA, MN

DATE	MEASURED DISCHARGE (ft^3/s)	TEMPERA-TURE (°C)	SPECIFIC CONDUC-TANCE (MICRO-MHOS)	DATE	MEASURED DISCHARGE (ft^3/s)	TEMPERA-TURE (°C)	SPECIFIC CONDUC-TANCE (MICRO-MHOS)
DEC. 01, 1986	10,700	1.5	---	APR. 30	4,600	17.0	360
FEB. 26, 1987	6,590	3.5	---	SEPT. 02	3,720	20.5	340

05291000 WHETSTONE RIVER NEAR BIG STONE CITY, SOUTH DAKOTA

DATE	MEASURED DISCHARGE (ft^3/s)	TEMPERA-TURE (°C)	SPECIFIC CONDUC-TANCE (MICRO-MHOS)	DATE	MEASURED DISCHARGE (ft^3/s)	TEMPERA-TURE (°C)	SPECIFIC CONDUC-TANCE (MICRO-MHOS)
OCT. 22, 1986	43	13.5	1,040	MAY 05	27	17.5	1,070
DEC. 15	24	1.5	1,670	JUNE 09	8.0	22.0	---
JAN. 30, 1987	15	.0	1,190	JULY 31	7.0	34.0	---
MAR. 13	53	3.0	850	SEPT. 18	8.7	20.0	---

05292000 MINNESOTA RIVER AT ORTONVILLE, MN

DATE	MEASURED DISCHARGE (ft^3/s)	TEMPERA-TURE (°C)	SPECIFIC CONDUC-TANCE (MICRO-MHOS)	DATE	MEASURED DISCHARGE (ft^3/s)	TEMPERA-TURE (°C)	SPECIFIC CONDUC-TANCE (MICRO-MHOS)
OCT. 22, 1986	64	13.0	975	JUNE 15	16	21.5	---
DEC. 01	18	1.0	1,180	JUNE 30	6.4	21.5	---
JAN. 30, 1987	32	0.5	940	JULY 31	4.7	34.0	---
MAR. 13	166	4.0	920	SEPT. 18	4.5	---	---
MAY 05	95	16.5	1,050				

WATER QUALITY DATA AT STREAMFLOW STATIONS, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

05293000 YELLOW BANK RIVER NEAR ODESSA, MN

DATE	MEASURED DISCHARGE (ft^3/s)	TEMPERATURE (^oC)	SPECIFIC CONDUCTANCE (MICROMHOS)	DATE	MEASURED DISCHARGE (ft^3/s)	TEMPERATURE (^oC)	SPECIFIC CONDUCTANCE (MICROMHOS)
OCT. 22, 1986......	41	13.0	950	MAY 05............	32	16.0	810
DEC. 15............	22	.0	1,360	JUNE 10............	12	20.0	---
JAN. 30, 1987......	16	.0	970	JULY 31............	2.2	34.5	---
MAR. 13............	63	4.0	740	SEPT. 18............	4.1	17.5	---

05294000 POMME DE TERRE RIVER AT APPLETON, MN

DATE	MEASURED DISCHARGE (ft^3/s)	TEMPERATURE (^oC)	SPECIFIC CONDUCTANCE (MICROMHOS)	DATE	MEASURED DISCHARGE (ft^3/s)	TEMPERATURE (^oC)	SPECIFIC CONDUCTANCE (MICROMHOS)
OCT. 01, 1986......	336	16.0	1,000	MAR. 16............	221	2.0	860
NOV. 10............	118	0.5	1,000	MAY 05............	143	17.0	750
DEC. 16............	178	1.0	920	JUNE 29............	63	24.0	---
JAN. 30, 1987......	135	0.5	810	SEPT. 01............	17	19.5	---

0530000 LAC QUI PARLE RIVER NEAR LAC QUI PARLE, MN

DATE	MEASURED DISCHARGE (ft^3/s)	TEMPERATURE (^oC)	SPECIFIC CONDUCTANCE (MICROMHOS)	DATE	MEASURED DISCHARGE (ft^3/s)	TEMPERATURE (^oC)	SPECIFIC CONDUCTANCE (MICROMHOS)
OCT. 30, 1986......	149	9.0	1,140	JUNE 30............	13	---	---
DEC. 16............	53	.0	1,690	JULY 31............	17	1.0	---
FEB. 03, 1987......	34	.0	1,420	AUG. 07............	4.5	---	---
MAR. 12............	136	.0	990	AUG. 07............	4.1	---	---
APR. 21............	192	12.0	1,230	SEPT. 02............	2.7	22.0	---
MAY 29............	69	17.5	1,340	SEPT. 21............	6.2	15.0	---
JUNE 19............	20	19.0	---				

05301000 MINNESOTA RIVER NEAR LAC QUI PARLE, MN

DATE	MEASURED DISCHARGE (ft^3/s)	TEMPERATURE (^oC)	SPECIFIC CONDUCTANCE (MICROMHOS)	DATE	MEASURED DISCHARGE (ft^3/s)	TEMPERATURE (^oC)	SPECIFIC CONDUCTANCE (MICROMHOS)
NOV. 04, 1986......	2,230	7.5	760	MAY 18............	259	18.0	850
NOV. 18............	1,190	---	---	JULY 06............	262	22.0	---
JAN. 12, 1987......	614	1.0	970	SEPT. 01............	23	20.0	---
FEB. 02............	481	4.0	970	SEPT. 02............	26	---	---
MAR. 30............	1,460	3.0	830				

05304500 CHIPPEWA RIVER NEAR MILAN, MN

DATE	MEASURED DISCHARGE (ft^3/s)	TEMPERATURE (^oC)	SPECIFIC CONDUCTANCE (MICROMHOS)	DATE	MEASURED DISCHARGE (ft^3/s)	TEMPERATURE (^oC)	SPECIFIC CONDUCTANCE (MICROMHOS)
NOV. 20, 1986......	891	.0	---	JUNE 05............	637	18.0	---
JAN. 12, 1987......	443	.0	790	JULY 27............	159	---	---
FEB. 25............	408	.0	730	SEPT. 10............	66	---	---
APR. 03............	---	4.5	630	SEPT. 15............	56	16.0	---
APR. 21............	775	14.0	660				

05311000 MINNESOTA RIVER AT MONTEVIDEO, MN

DATE	MEASURED DISCHARGE (ft^3/s)	TEMPERATURE (^oC)	SPECIFIC CONDUCTANCE (MICROMHOS)	DATE	MEASURED DISCHARGE (ft^3/s)	TEMPERATURE (^oC)	SPECIFIC CONDUCTANCE (MICROMHOS)
NOV. 04, 1986......	3,100	6.5	765	JULY 09............	269	---	---
JAN. 12, 1987......	779	---	---	JULY 27............	333	---	---
MAR. 30............	2,190	2.0	855	SEPT. 02............	48	19.0	---
MAY 18............	504	18.0	830	SEPT. 21............	37	17.0	---
JULY 07............	332	---	---				

WATER QUALITY DATA AT STREAMFLOW STATIONS, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

05311400 SOUTH BRANCH YELLOW MEDICINE RIVER AT MINNEOTA, MN

DATE	MEASURED DISCHARGE (ft^3/s)	TEMPERATURE ($^{\circ}$C)	SPECIFIC CONDUCTANCE (MICROMHOS)	DATE	MEASURED DISCHARGE (ft^3/s)	TEMPERATURE ($^{\circ}$C)	SPECIFIC CONDUCTANCE (MICROMHOS)
OCT. 29, 1986	30	12.0	1,260	APR. 20	40	14.0	1,400
DEC. 02	30	1.5	1,460	JUNE 08	5.3	17.5	---
JAN. 27, 1987	8.1	.0	1,240	AUG. 14	1.9	20.5	---
MAR. 04	14	3.5	1,240				

05313500 YELLOW MEDICINE RIVER NEAR GRANITE FALLS, MN

DATE	MEASURED DISCHARGE (ft^3/s)	TEMPERATURE ($^{\circ}$C)	SPECIFIC CONDUCTANCE (MICROMHOS)	DATE	MEASURED DISCHARGE (ft^3/s)	TEMPERATURE ($^{\circ}$C)	SPECIFIC CONDUCTANCE (MICROMHOS)
OCT. 29, 1986	277	10.0	1,415	APR. 20	256	16.5	1,460
DEC. 12	129	.0	1,770	MAY 29	184	17.0	1,760
JAN. 27, 1987	44	.0	1,505	JULY 17	211	22.0	---
MAR. 04	98	1.0	1,230	SEPT. 01	17	18.5	---

05315000 REDWOOD RIVER NEAR MARSHALL, MN

DATE	MEASURED DISCHARGE (ft^3/s)	TEMPERATURE ($^{\circ}$C)	SPECIFIC CONDUCTANCE (MICROMHOS)	DATE	MEASURED DISCHARGE (ft^3/s)	TEMPERATURE ($^{\circ}$C)	SPECIFIC CONDUCTANCE (MICROMHOS)
OCT. 29, 1986	95	12.0	1,070	MAR. 23	279	5.0	880
DEC. 02	100	.0	1,050	MAY 12	33	18.0	990
JAN. 27, 1987	18	.0	1,250	JULY 10	24	22.5	---
MAR. 04	30	4.0	1,050	AUG. 31	6.5	16.0	---

05316500 REDWOOD RIVER NEAR REDWOOD FALLS, MN

DATE	MEASURED DISCHARGE (ft^3/s)	TEMPERATURE ($^{\circ}$C)	SPECIFIC CONDUCTANCE (MICROMHOS)	DATE	MEASURED DISCHARGE (ft^3/s)	TEMPERATURE ($^{\circ}$C)	SPECIFIC CONDUCTANCE (MICROMHOS)
OCT. 21, 1986	287	15.0	1,340	MAY 12	112	16.0	1,230
DEC. 12	117	.0	1,710	JULY 09	134	22.0	---
JAN. 29, 1987	48	.0	1,650	AUG. 31	18	18.5	---
MAR. 27	1,030	8.0	1,425				

05317000 COTTONWOOD RIVER NEAR NEW ULM, MN

DATE	MEASURED DISCHARGE (ft^3/s)	TEMPERATURE ($^{\circ}$C)	SPECIFIC CONDUCTANCE (MICROMHOS)	DATE	MEASURED DISCHARGE (ft^3/s)	TEMPERATURE ($^{\circ}$C)	SPECIFIC CONDUCTANCE (MICROMHOS)
OCT. 27, 1986	756	11.5	1,180	MAY 11	294	23	1,120
DEC. 16	334	.5	1,290	JUNE 23	957	---	---
FEB. 03, 1987	148	.0	1,260	AUG. 17	73	---	870
MAR. 24	1,320	8.0	1,070				

05317200 LITTLE COTTONWOOD RIVER NEAR COURTLAND, MN

DATE	MEASURED DISCHARGE (ft^3/s)	TEMPERATURE ($^{\circ}$C)	SPECIFIC CONDUCTANCE (MICROMHOS)	DATE	MEASURED DISCHARGE (ft^3/s)	TEMPERATURE ($^{\circ}$C)	SPECIFIC CONDUCTANCE (MICROMHOS)
OCT. 28, 1986	103	10.0	980	MAY 12	28.6	15.5	---
DEC. 16	37.0	---	1,010	JUNE 23	29.1	.5	---
FEB. 04, 1987	19.4	.0	860	AUG. 17	3.7	22.5	875
MAR. 24	76.6	9.5	670				

05319500 WATONWAN RIVER NEAR GARDEN CITY, MN

DATE	MEASURED DISCHARGE (ft^3/s)	TEMPERATURE ($^{\circ}$C)	SPECIFIC CONDUCTANCE (MICROMHOS)	DATE	MEASURED DISCHARGE (ft^3/s)	TEMPERATURE ($^{\circ}$C)	SPECIFIC CONDUCTANCE (MICROMHOS)
OCT. 29, 1986	441	11.0	940	MAY 13	112	17.5	---
DEC. 17	184	.0	---	JUNE 23	74.9	---	---
FEB. 11, 1987	94.9	.0	820	AUG. 24	18.8	---	---
MAR. 26	832	6.0	920				

WATER QUALITY DATA AT STREAMFLOW STATIONS, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	MEASURED DISCHARGE (ft^3/s)	TEMPERATURE (^oC)	SPECIFIC CONDUCTANCE (MICROMHOS)	DATE	MEASURED DISCHARGE (ft^3/s)	TEMPERATURE (^oC)	SPECIFIC CONDUCTANCE (MICROMHOS)
05320000 BLUE EARTH NEAR RAPIDAN, MN							
OCT. 28, 1986......	1,270	12.0	850	MAY 12........... ..	640	21.5	615
DEC. 18............	591	.0	980	JULY 15............	1,730	---	---
FEB. 12, 1987......	257	.5	790	AUG. 24............	576	20.5	---
MAR. 25	888	9.0	810				
05320500 LE SUEUR RIVER NEAR RAPIDAN, MN							
OCT. 28, 1986......	782	11.0	790	MAY 04............	126	---	---
DEC. 18............	252	.0	870	JUNE 23............	31	---	---
FEB. 05, 1987......	112	.0	890	AUG. 18............	430	25.0	760
MAR. 25............	244	9.5	660				
05325000 MINNESOTA RIVER AT MANKATO, MN							
OCT. 29, 1986......	7,860	11.0	980	MAY 05............	3,140	15.5	925
DEC. 17............	3,400	.0	1,170	JUNE 30............	1,830	24.0	---
FEB. 04, 1987......	1,500	.0	1,040	AUG. 11............	1,550	---	---
MAR. 24............	3,720	8.0	950				
05327000 HIGH ISLAND CREEK NEAR HENDERSON, MN							
OCT. 27, 1986......	107	11.5	890	MAR. 23............	29.7	4.0	750
NOV. 26............	61.2	.5	---	MAY 04............	14.4	---	---
DEC. 16............	24.0	.5	1,060	JUNE 22............	16.4	---	---
FEB. 03, 1987......	9.93	.5	1,050	AUG. 18.	14.7	22.0	760
05330000 MINNESOTA RIVER NEAR JORDAN, MN							
OCT. 28, 1986......	9,350	---	---	APR. 28............	4,930	16.0	860
DEC. 18............	4,080	.5	1,040	MAY 27............	3,000	19.0	960
JAN. 13, 1987......	2,510	.5	980	JUNE 29............	2,990	---	---
JAN. 27............	1,650	---	---	JULY 20............	3,460	27.5	879
FEB. 19............	2,060	.0	920	AUG. 25............	1,190	19.5	---
MAR. 30............	9,150	4.5	1,070	SEPT. 23............	729	17.5	---
05331000 MISSISSIPPI RIVER AT ST. PAUL, MN							
SEPT. 08, 1987......	3,700	23	---				
05336700 KETTLE RIVER BELOW SANDSTONE, MN							
OCT. 21, 1986......	816	8.5	90	MAY 05............	291	14.5	---
DEC. 09............	349	.0	160	JUNE 16............	229	24.0	---
JAN. 20, 1987......	220	1.0	190	SEPT. 29............	122	16.0	195
FEB. 18..........	202	.0	190				

WATER QUALITY DATA AT STREAMFLOW STATIONS, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

05337400 KNIFE RIVER NEAR MORA, MN

DATE	MEASURED DISCHARGE (ft^3/s)	TEMPERATURE (°C)	SPECIFIC CONDUCTANCE (MICRO MHOS)	DATE	MEASURED DISCHARGE (ft^3/s)	TEMPERATURE (°C)	SPECIFIC CONDUCTANCE (MICROMHOS)
OCT. 20, 1986	68.2	11.5	120	MAY 04	15.0	18.0	---
DEC. 09	27.5	.0	190	JUNE 15	13.2	28.0	---
JAN. 20, 1987	15.3	.0	240	AUG. 03	5.00	27.5	---
MAR. 04	16.7	5.0	195	SEPT. 28	1.68	17.0	280

05344500 MISSISSIPPI RIVER AT PRESCOTT, WISCONSIN

DATE	MEASURED DISCHARGE (ft^3/s)	TEMPERATURE (°C)	SPECIFIC CONDUCTANCE (MICRO MHOS)
APR. 08, 1987	21,700	---	---

05345000 VERMILLION RIVER NEAR EMPIRE, MN

DATE	MEASURED DISCHARGE (ft^3/s)	TEMPERATURE (°C)	SPECIFIC CONDUCTANCE (MICRO MHOS)	DATE	MEASURED DISCHARGE (ft^3/s)	TEMPERATURE (°C)	SPECIFIC CONDUCTANCE (MICROMHOS)
NOV. 20, 1986	59	3.0	700	MAY 21	42	19.5	720
DEC. 23	56	4.0	730	JULY 09	33	23.5	---
FEB. 04, 1987	39	3.0	780	AUG. 18	55	25	---
APR. 01	54	5.0	730				

05353800 STRAIGHT RIVER NEAR FARIBULT, MN

DATE	MEASURED DISCHARGE (ft^3/s)	TEMPERATURE (°C)	SPECIFIC CONDUCTANCE (MICRO MHOS)	DATE	MEASURED DISCHARGE (ft^3/s)	TEMPERATURE (°C)	SPECIFIC CONDUCTANCE (MICROMHOS)
OCT. 09, 1986	75	10.5	920	APR. 09	118	13.0	720
NOV. 06	271	5.0	800	JUNE 16	35	---	---
JAN. 08, 1987	120	.0	750	JULY 21	106	26	---
FEB. 26	75	2.0	700	SEPT. 17	54	18.5	---

05372995 SOUTH FORK ZUMBRO RIVER AT ROCHESTER, MN

DATE	MEASURED DISCHARGE (ft^3/s)	TEMPERATURE (°C)	SPECIFIC CONDUCTANCE (MICRO MHOS)	DATE	MEASURED DISCHARGE (ft^3/s)	TEMPERATURE (°C)	SPECIFIC CONDUCTANCE (MICROMHOS)
OCT. 08, 1986	682	---	---	APR. 16	123	12.5	630
DEC. 02	203	5.0	650	JUNE 17	108	23.5	---
JAN. 07, 1987	123	5.0	640	JULY 23	55	29.5	---
FEB. 25	94	6.5	630	AUG. 18	67	---	---
MAR. 11	155	7.0	---	SEPT. 16	62	13.5	---

05374900 ZUMBRO RIVER AT KELLOGG, MN

DATE	MEASURED DISCHARGE (ft^3/s)	TEMPERATURE (°C)	SPECIFIC CONDUCTANCE (MICRO MHOS)	DATE	MEASURED DISCHARGE (ft^3/s)	TEMPERATURE (°C)	SPECIFIC CONDUCTANCE (MICROMHOS)
OCT. 06, 1986	3,500	12.0	610	APR. 14	685	11.0	540
NOV. 24	1,130	1.5	610	JUNE 04	535	---	---
JAN. 05, 1987	681	2.5	620	JULY 22	589	27.0	---
FEB. 23	598	3.5	620	SEPT. 09	512	17.5	---

05376000 NORTH FORK WHITEWATER RIVER NEAR ELBA, MN

DATE	MEASURED DISCHARGE (ft^3/s)	TEMPERATURE (°C)	SPECIFIC CONDUCTANCE (MICRO MHOS)	DATE	MEASURED DISCHARGE (ft^3/s)	TEMPERATURE (°C)	SPECIFIC CONDUCTANCE (MICROMHOS)
NOV. 24, 1986	65	3.0	610	MAY 05	40	12.5	540
DEC. 16	55	2.0	570	JUNE 04	37	---	---
JAN. 14, 1987	51	3.5	600	SEPT. 17	39	15	550
MAR. 26	56	7.5	560				

WATER QUALITY DATA AT STREAMFLOW STATIONS, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

05378235 GARVIN BROOK NEAR MINNESOTA CITY. MN

DATE	MEASURED DISCHARGE (ft^3/s)	TEMPERATURE (^{o}C)	SPECIFIC CONDUCTANCE (MICROMHOS)	DATE	MEASURED DISCHARGE (ft^3/s)	TEMPERATURE (^{o}C)	SPECIFIC CONDUCTANCE (MICROMHOS)
OCT. 06, 1986......	48	10.5	580	APR. 14............	38	10.0	500
NOV. 25............	35	4.5	540	JUNE 03............	35	---	---
JAN. 05, 1987......	33	4.5	520	JULY 23............	20	21.0	---
FEB. 23............	36	6.5	500	SEPT. 09............	32	---	---

05378500 MISSISSIPPI RIVER AT WINONA, MN

DATE	MEASURED DISCHARGE (ft^3/s)	TEMPERATURE (^{o}C)	SPECIFIC CONDUCTANCE (MICROMHOS)
AUG. 26, 1987......	13,800	21.0	---

05384000 ROOT RIVER NEAR LANESBORO, MN

DATE	MEASURED DISCHARGE (ft^3/s)	TEMPERATURE (^{o}C)	SPECIFIC CONDUCTANCE (MICROMHOS)	DATE	MEASURED DISCHARGE (ft^3/s)	TEMPERATURE (^{o}C)	SPECIFIC CONDUCTANCE (MICROMHOS)
DEC. 02, 1986......	390	2.5	580	APR. 15............	315	10.5	540
JAN. 06, 1987......	293	1.5	570	JULY 30............	232	26.0	---
FEB. 24............	253	3.5	550				

05385000 ROOT RIVER NEAR HOUSTON, MN

DATE	MEASURED DISCHARGE (ft^3/s)	TEMPERATURE (^{o}C)	SPECIFIC CONDUCTANCE (MICROMHOS)	DATE	MEASURED DISCHARGE (ft^3/s)	TEMPERATURE (^{o}C)	SPECIFIC CONDUCTANCE (MICROMHOS)
OCT. 07, 1986......	2,820	12.0	590	FEB. 24............	636	3.5	650
NOV. 25............	968	1.0	600	JUNE 02............	657	---	---
JAN. 06, 1987......	733	1.5	570	SEPT. 10............	463	16.5	---

05385500 SOUTH FORK ROOT RIVER NEAR HOUSTON, MN

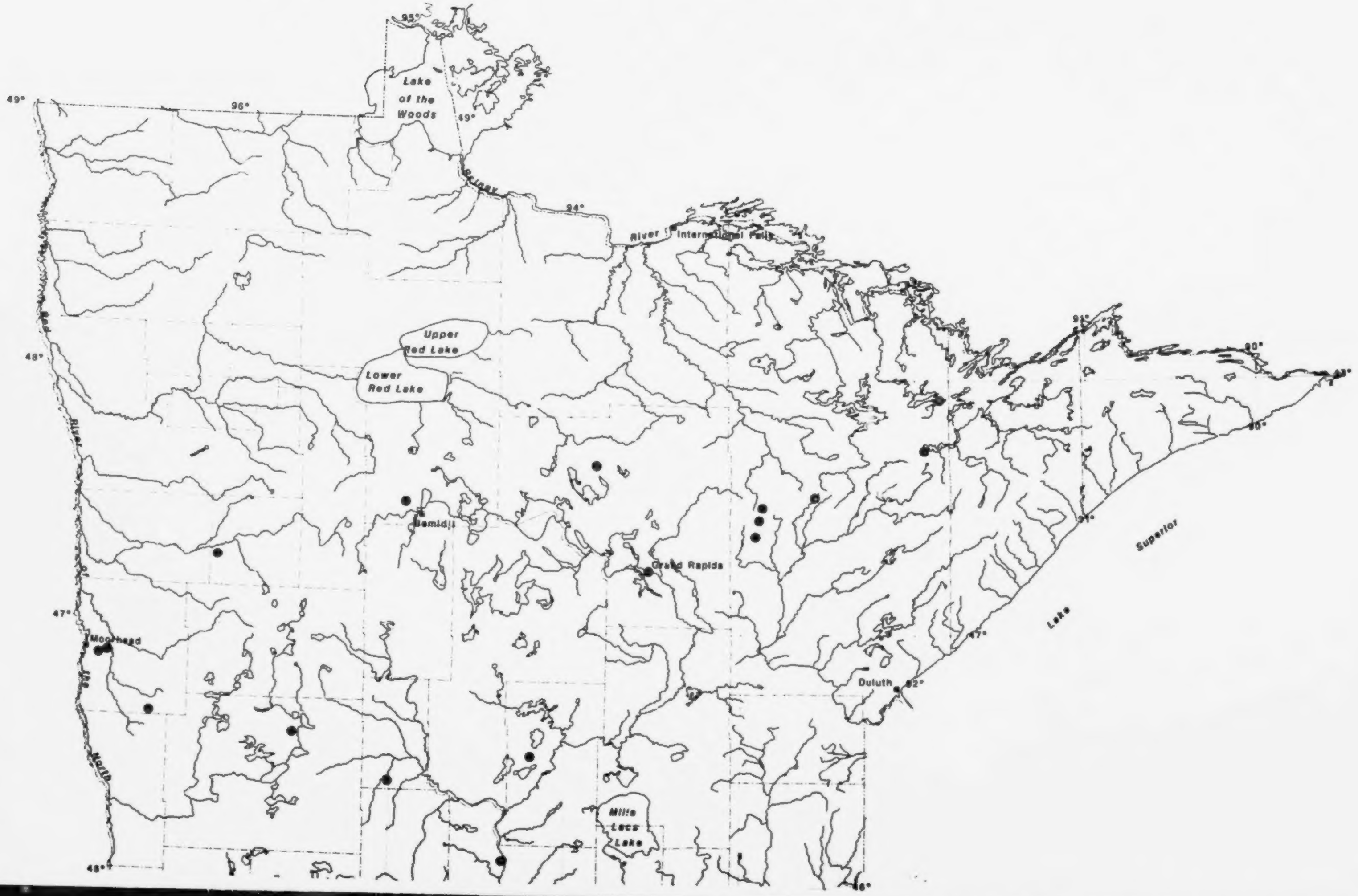
DATE	MEASURED DISCHARGE (ft^3/s)	TEMPERATURE (^{o}C)	SPECIFIC CONDUCTANCE (MICROMHOS)	DATE	MEASURED DISCHARGE (ft^3/s)	TEMPERATURE (^{o}C)	SPECIFIC CONDUCTANCE (MICROMHOS)
OCT. 07, 1986......	307	11.5	610	FEB. 24............	165	3.5	540
NOV. 25............	188	2.5	540	JUNE 02............	182	---	---
JAN. 06, 1987......	174	2.5	530	SEPT. 10............	144	11.0	---

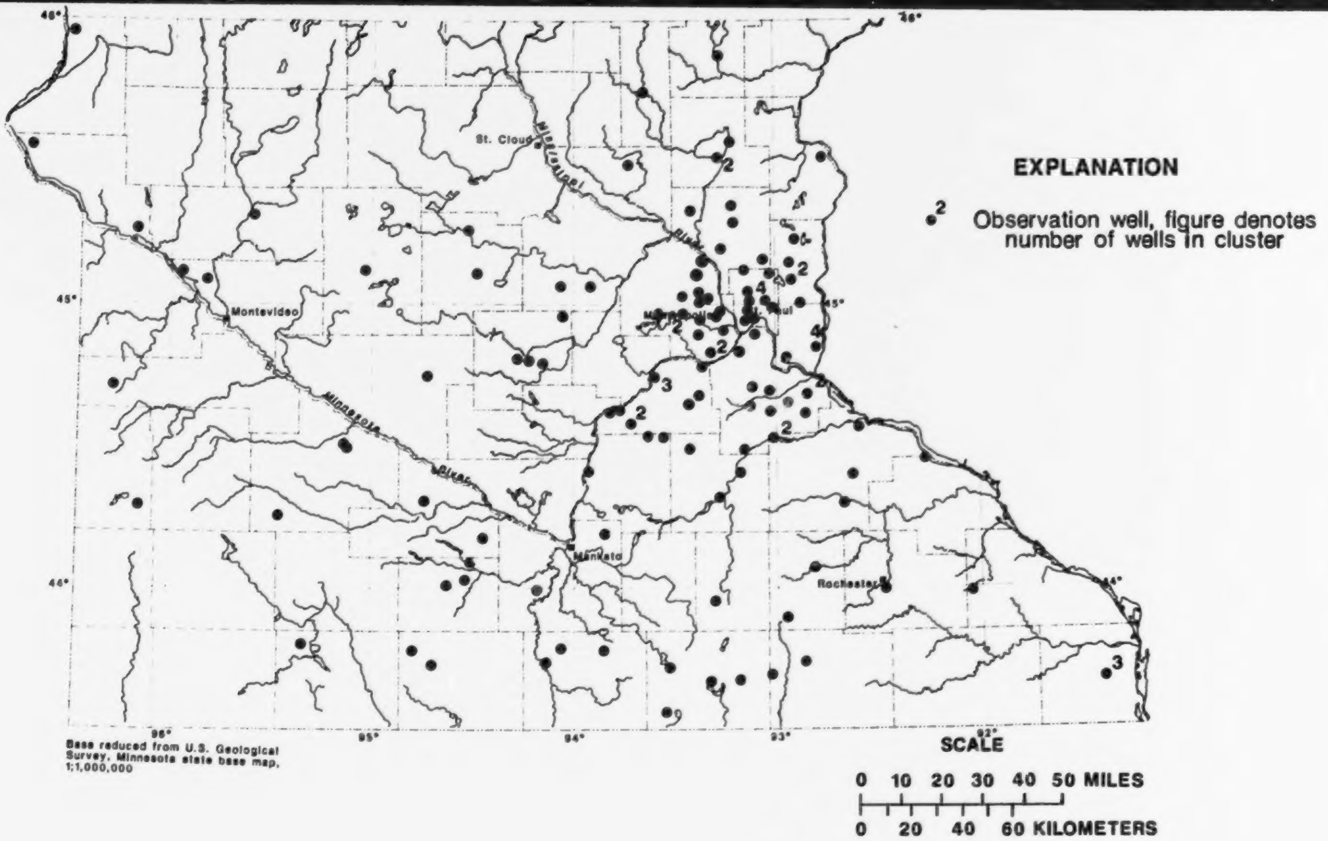
05457000 CEDAR RIVER NEAR AUSTIN, MN

DATE	MEASURED DISCHARGE (ft^3/s)	TEMPERATURE (^{o}C)	SPECIFIC CONDUCTANCE (MICROMHOS)	DATE	MEASURED DISCHARGE (ft^3/s)	TEMPERATURE (^{o}C)	SPECIFIC CONDUCTANCE (MICROMHOS)
OCT. 08, 1986......	498	13.0	650	APR. 16............	134	10.5	640
DEC. 03............	218	2.0	600	JUNE 16............	60	25.0	---
JAN. 07, 1987......	110	2.5	630	JULY 21............	94	27	---
FEB. 25............	88	6.0	630	SEPT. 15............	86	16	---

05476000 DES MOINES RIVER AT JACKSON, MN

DATE	MEASURED DISCHARGE (ft^3/s)	TEMPERATURE (^{o}C)	SPECIFIC CONDUCTANCE (MICROMHOS)	DATE	MEASURED DISCHARGE (ft^3/s)	TEMPERATURE (^{o}C)	SPECIFIC CONDUCTANCE (MICROMHOS)
OCT. 21, 1986......	1,140	---	---	MAY 22............	292	17.0	790
DEC. 11............	289	0.5	1,060	JUNE 12............	246	20.5	---
JAN. 29, 1987......	121	1.0	1,130	JULY 13............	532	---	---
FEB. 10............	137	1.5	900	AUG. 27............	66	---	---
MAR. 24............	1,170	7.0	710				


95°
Lake of the Woods
49°
96°
49°
Rainy
94°
River
International Falls
Upper Red Lake
Lower Red Lake
48°
91°
90°
90°
Bemidji
Grand Rapids
91°
Superior
Lake
47°
Moorhead
47°
Duluth
92°
Red River of the North
Mille Lacs Lake
46°
46°


46°
45°
44°
96°
95°
94°
93°
92°
St. Cloud
Mississippi River
Minneapolis
St. Paul
Montevideo
Minnesota River
Mankato
Rochester
EXPLANATION
2 Observation well, figure denotes number of wells in cluster
SCALE
0 10 20 30 40 50 MILES
0 20 40 60 KILOMETERS

Base reduced from U.S. Geological Survey, Minnesota state base map, 1:1,000,000

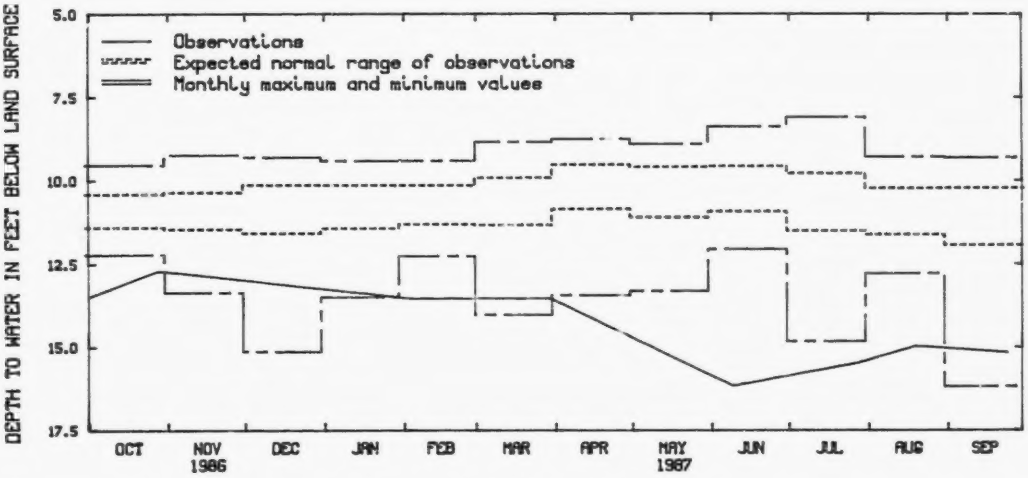
Figure 11.--Location of ground-water wells

ANOKA COUNTY

450927093033802. Local number, 031N22W23CBC02.
LOCATION.--Lat 45°09'27", long 93°03'38", in SW¼NW¼SW¼ sec.23, T.31 N., R.22 W., Hydrologic Unit 07010206, at city of Genterville.
Owner: U.S. Geological Survey.
AQUIFER.--Jordan Sandstone of Late Cambrian Age.
WELL CHARACTERISTICS.--Drilled observation artesian well, diameter 4 in. (0.10 m), depth 277 ft (84.4 m), screened 272 to 277 ft (82.9 to 84.4 m).
DATUM.--Land-surface datum is 901.6 ft (274.8 m) National Geodetic Vertical Datum of 1929. Measuring point: Top of recorder platform, 2.20 ft (0.67 m) above land-surface datum.
REMARKS.--Water level affected by nearby flowing wells.
PERIOD OF RECORD.--February 1971 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 8.10 ft (2.47 m) below land-surface datum, July 5, 1975; lowest, 16.20 ft (4.94 m) below land-surface datum, Sept. 15, 1976.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct. 28	12.70	Mar. 30	13.54	June 9	16.19	July 28	15.47	Aug. 19	14.97	Sep. 24	15.19
Feb. 4	13.57										



Ground-water levels, 1987 water year
Well 031N22W23CBC02

451210093170201. Local number, 031N24W01CBB01.
LOCATION.--Lat 45°12'10", long 93°17'02", in NW¼NW¼SW¼ sec.1, T.31 N., R.24 W., Hydrologic Unit 07010206, at Golf Course.
Owner: City of Coon Rapids.
AQUIFER.--Buried sand of Pleistocene Age.
WELL CHARACTERISTICS.--Drilled irrigation artesian well, diameter 12 in. (0.30 m), depth 193 ft (58.8 m), screened 163 to 193 ft (49.7 to 58.8 m).
DATUM.--Altitude of land-surface datum is 897 ft (273 m). Measuring point: Top of breather pipe, 2.00 ft (0.61 m) above land-surface datum.
PERIOD OF RECORD.--December 1980 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 18.43 ft (5.61 m) below land-surface datum, May 13, 1986; lowest, 31.30 ft (9.54 m) below land-surface datum, July 13, 1983.

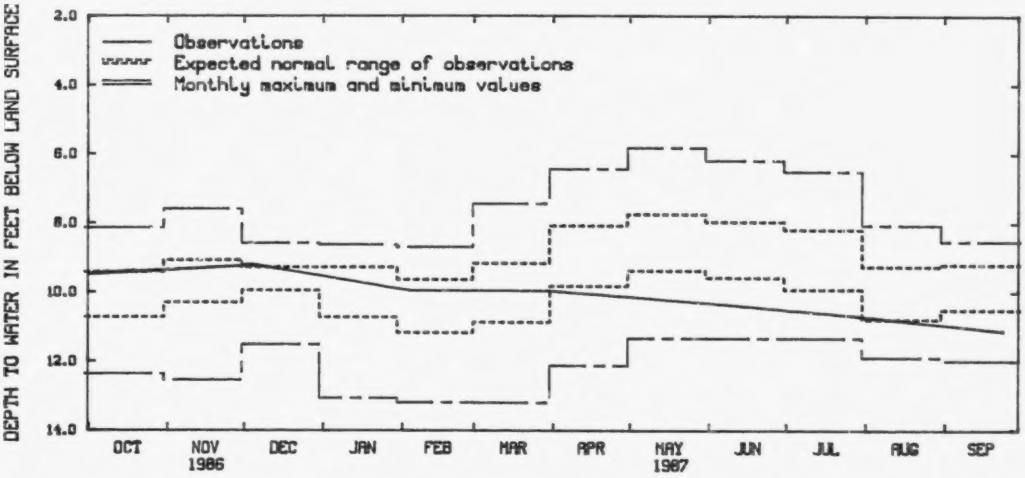
WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Dec. 5	19.27	Feb. 4	20.63	Mar. 30	20.97	July 29	28.35	Sep. 24	29.78

451742093122102. Local number, 032N23W04AAD02.
LOCATION.--Lat 45°17'42", long 93°12'21", in SE¼NE¼NE¼ sec.4, T.32 N., R.23 W., Hydrologic Unit 07030005, 1.5 mi (2.4 km) east of Soderville.
Owner: U.S. Geological Survey.
AQUIFER.--Surficial outwash sand of Pleistocene Age.
WELL CHARACTERISTICS.--Bored observation water-table well, diameter 2 in. (0.05 m), depth 21 ft (6.4 m), screened 19 to 21 ft (5.8 to 6.4 m).
DATUM.--Altitude of land-surface datum is 916 ft (279 m). Measuring point: Top of casing, 3.50 ft (1.07 m) above land-surface datum.
PERIOD OF RECORD.--August 1969 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 5.82 ft (1.77 m) below land-surface datum, May 13, 1986; lowest, 13.22 ft (4.03 m) below land-surface datum, Mar. 5-9, 1977.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Dec. 5	9.22	Feb. 4	9.97	Mar. 30	9.98	June 9	10.39	July 29	10.72	Sep. 24	11.15

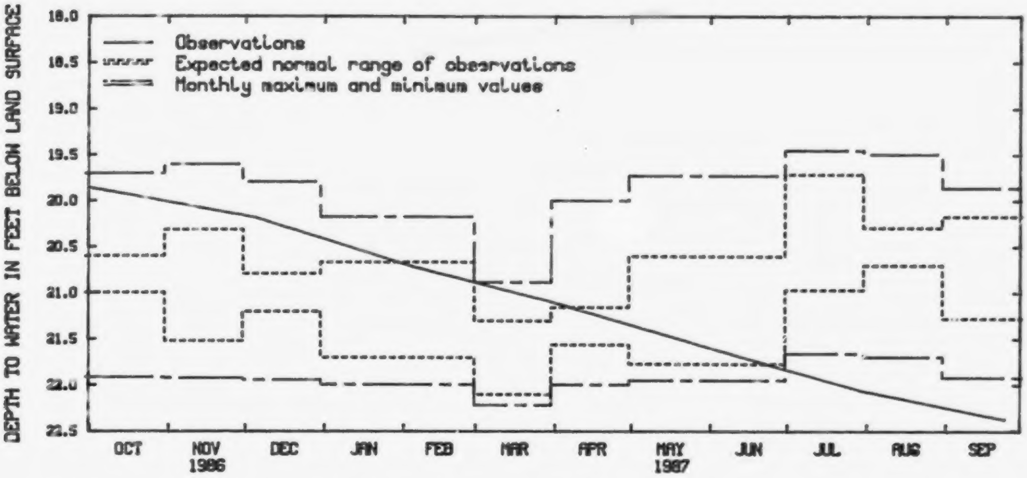


Ground-water levels, 1987 water year
Well 032N23W04AAD02

452305093141501. Local number, 033N23W05BAB01.
LOCATION.--Lat 45°23'05", long 93°14'15", in NW¼NE¼NW¼ sec.5, T.33 N., R.23 W., Hydrologic Unit 07010207, at 1300 229th Ave. NE, Bethel.
Owner: Friendship Baptist Church.
AQUIFER.--Franconian Sandstone of Late Cambrian Age.
WELL CHARACTERISTICS.--Drilled domestic artesian well, diameter 4 in. (0.10 m), depth 141 ft (43.0 m), cased to 126 ft (38.4 m).
DATUM.--Altitude of land-surface datum is 923 ft (281 m). Measuring point: Top of well cap, 0.80 ft (0.24 m) above land-surface datum.
PERIOD OF RECORD.--April 1980 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 19.48 ft (5.94 m) below land-surface datum, July 12, 1984; lowest, 22.38 ft (6.82 m) below land-surface datum, Sept. 24, 1987.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Dec. 5	20.19	Feb. 4	20.72	Mar. 30	21.10	June 9	21.67	July 29	22.06	Sep. 24	22.38



Ground-water levels, 1987 water year
Well 033N23W05BAB01

451938093223101. Local number, 033N24W30ABB01.

LOCATION.--Lat 45°19'38", long 93°22'31", in NW¼NW¼NE¼ sec.30, T.33 N., R.24 W., Hydrologic Unit 07010207, at 4324 Viking Blvd.

Owner: Northwestern Bell Telephone Co.

AQUIFER.--Ironton-Galesville Sandstone of Late Cambrian Age.

WELL CHARACTERISTICS.--Drilled domestic artesian well, diameter 4 in. (0.10 m), depth 280 ft (85.3 m), cased to 223 ft (68.0 m).

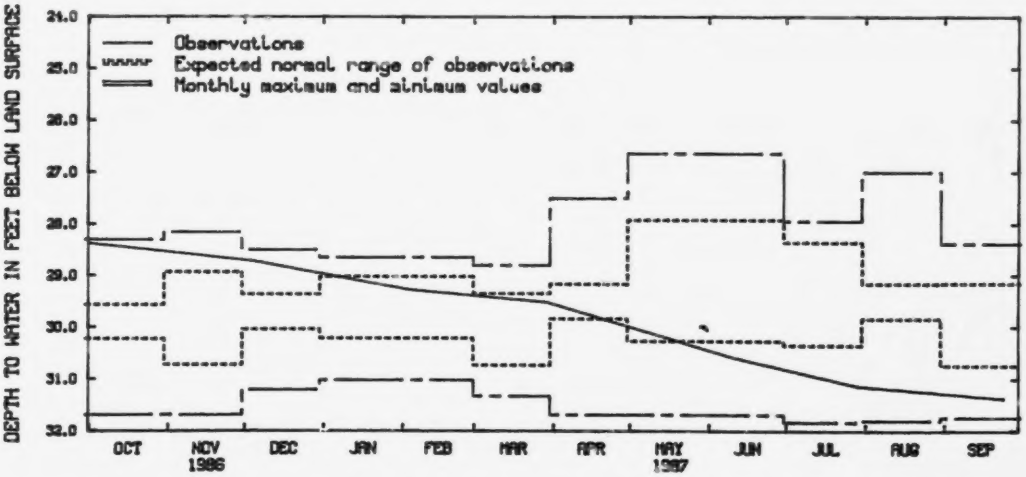
DATUM.--Altitude of land-surface datum is 900 ft (274 m). Measuring point: Top of casing, 1.50 ft (0.46 m) above land-surface datum.

PERIOD OF RECORD.--April 1977 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level, 26.64 ft (8.11 m) below land-surface datum, May 13, 1986; lowest, 31.84 ft (9.70 m) below land-surface datum, July 11, 1977.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Dec. 5	28.72	Feb. 4	29.28	Mar. 30	29.53	June 9	30.58	July 29	31.15	Sep. 24	31.39



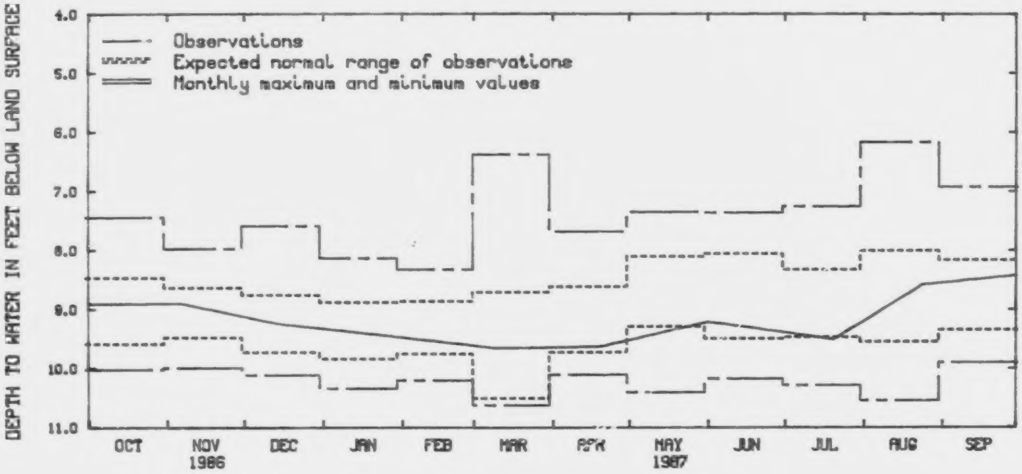
Ground-water levels, 1987 water year
Well 033N24W30ABB01

BELTRAMI COUNTY

473023094570901. Local number, 147N34W35ADC01.
LOCATION.--Lat 47°30'23", long 94°57'09", in SW¼SE¼NE¼ sec.35, T.147 N., R.34 W., Hydrologic Unit 07010101, on Clarence Hart farm.
Owner: U.S. Geological Survey.
AQUIFER.--Surficial outwash sand of Pleistocene Age.
WELL CHARACTERISTICS.--Bored observation water-table well, diameter 1¼ in. (0.03 m), depth 20 ft (6.1 m), screened 18 to 20 ft (5.5 to 6.1 m).
DATUM.--Altitude of land-surface datum is 1,383 ft (421 m). Measuring point: Top of casing, 3.00 ft (0.91 m) above land-surface datum.
PERIOD OF RECORD.--October 1970 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 6.17 ft (1.88 m) below land-surface datum, Aug. 1, 1975; lowest, 10.63 ft (3.22 m) below land-surface datum, Mar. 16, 1981.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Nov. 6	8.90	Jan. 28	9.47	Apr. 20	9.63	June 1	9.21	July 20	9.52	Aug. 24	8.58
Dec. 15	9.26	Mar. 9	9.67								



Ground-water levels, 1987 water year
Well 147N34W35ADC01

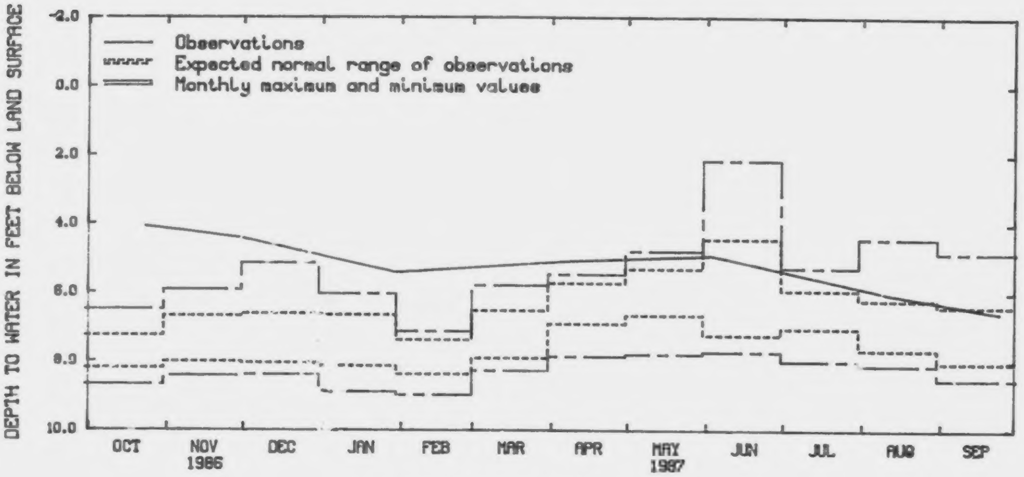
BIG STONE COUNTY

451517096104501. Local number, 121N44W27CCC01.
LOCATION.--Lat 45°15'17", long 96°10'45", in SW¼SW¼SW¼ sec.27, T.121 N., R.44 W., Hydrologic Unit 07010001, north of Correll.
Owner: U.S. Geological Survey
AQUIFER.--Surficial sand and gravel of Pleistocene Age.
WELL CHARACTERISTICS.--Bored observation water-table well, diameter 1¼ in. (0.03 m), depth 16 ft (4.9 m), screened 14 to 15 ft (4.3 to 4.9 m).
DATUM.--Altitude of land-surface datum is 1,018 ft (310 m). Measuring point: Top of casing, 3.10 ft (0.94 m) above land-surface datum.
PERIOD OF RECORD.--September 1972 to February 1974, August 1976 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 2.16 ft (0.65m) below land-surface datum, June 12, 1986; lowest, 8.98 ft (2.74 m) below land-surface datum, Feb. 8, 1977.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct. 23	4.10	Jan. 30	5.44	Apr. 6	5.10	June 3	4.92	Aug. 10	6.03	Sep. 24	6.59
Dec. 1	4.45										

BIG STONE--Continued



Ground-water levels, 1987 water year
Well 121N44W27CCC01

453330096420201. Local number, 124N48W17AAA01.
LOCATION.--Lat 45°33'30", long 96°42'02", in NE¼NE¼NE¼ sec.17, T.124 N., R.48 W., Hydrologic Unit 07020001, 0.5 mi (0.8 km) east of Beardsley.
Owner: U.S. Geological Survey.
AQUIFER.--Buried sand of Pleistocene Age.
WELL CHARACTERISTICS.--Drilled observation artesian well, diameter 2 in. (0.05 m), depth 282 ft (86.0 m), screened 242 to 282 ft (73.8 to 86.0 m).
DATUM.--Altitude of land-surface datum is 1,086.8 ft (331.3 m) National Geodetic Vertical Datum of 1929. Measuring point: Top of casing, 3.60 ft (1.10 m) above land-surface datum.
PERIOD OF RECORD.--November 1978 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 10.90 ft (3.32 m) below land-surface datum, Apr. 11, 1979; lowest, 21.75 ft (6.63 m) below land-surface datum, Aug. 25, 1982.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Nov. 12	9.92	Feb. 12	9.91	Mar. 23	9.77	June 3	10.89	Aug. 10	16.32

BLUE EARTH COUNTY

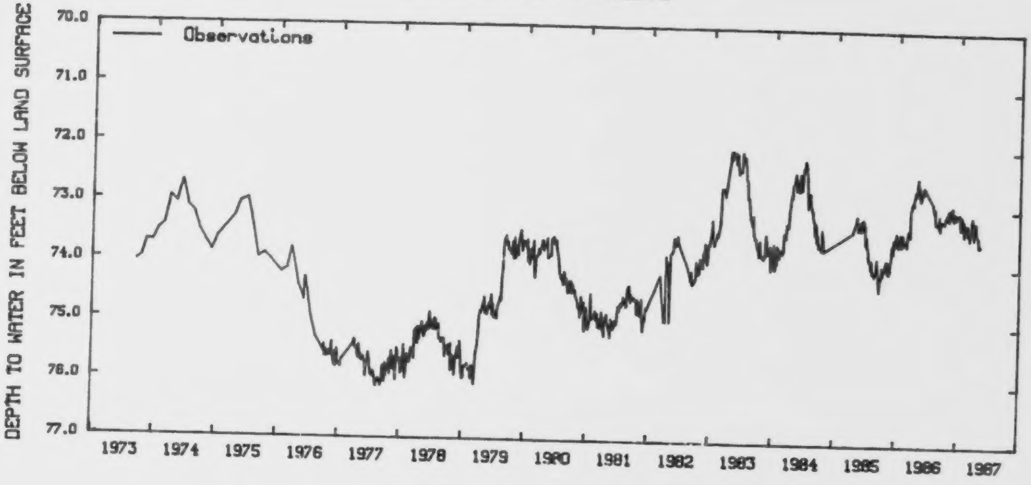
440050094102801. Local number, 106N28W03DBA01.
LOCATION.--Lat 44°00'50", long 94°10'28", in NE¼NW¼SE¼ sec.3, T.106 N., R.28 W., Hydrologic Unit 07020010, at Farmland Industries Ammonia Plant, 3.2 mi (5.2 km) north of Vernon Center.
Owner: Farmland Industries.
AQUIFER.--Ironton-Galesville Sandstones of Late Cambrian Age.
WELL CHARACTERISTICS.--Drilled unused artesian well, diameter 16 in. (0.41 m), depth 390 ft (119 m), cased to 150 ft (45.7 m).
DATUM.--Altitude of land-surface datum is 1,005 ft (306 m). Measuring point: Top of recorder floor, 2.00 ft (0.61 m) above land-surface datum.
PERIOD OF RECORD.--October 1973 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 71.81 ft (21.89 m) below land-surface datum, Apr. 26, 1983; lowest, 76.17 ft (23.22 m) below land-surface datum, Aug. 17, 1977.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987
LOWEST VALUES

DATE	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY
5	73.18	72.98	73.15	73.04	73.42	73.34	73.47	73.59
10	73.21	73.15	73.03	73.09	73.25	73.48	73.19	73.58
15	73.11	73.00	73.05	73.30	73.22	73.36	73.19	
20	73.12	72.96	73.13	73.09	73.32	73.26	73.39	
25	73.05	72.93	73.06	73.20	73.39	73.10	73.43	
EOM	73.14	73.12	73.07	73.16	73.22	73.24	73.45	

WTR YEAR 1987 HIGHEST 72.91 NOV. 6, 1986 LOWEST 73.76 MAY 12, 1987

BLUE EARTH COUNTY--Continued

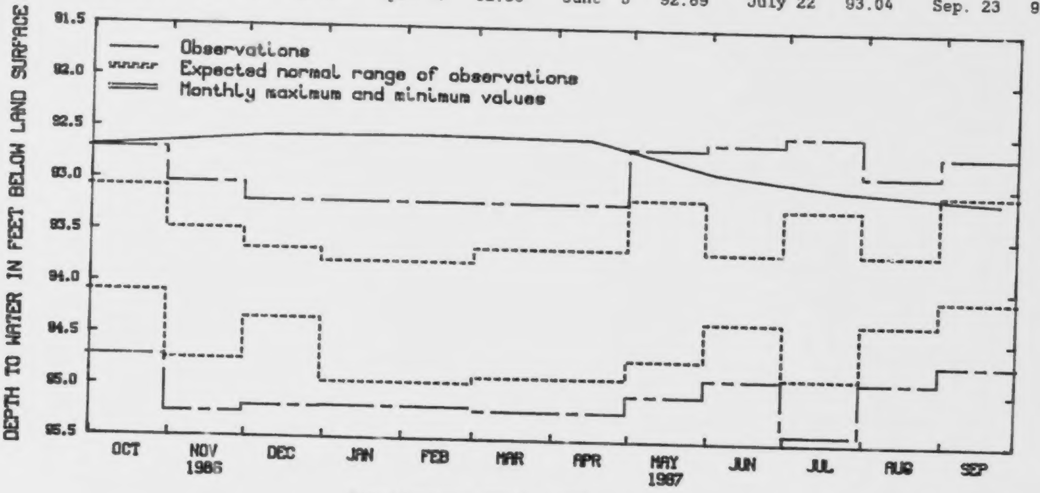


Ground-water levels, 1973-87
Well 106N28W03DBA01

441134093505301. Local number, 108N25W04BBC01.
LOCATION.--Lat 44°11'34", long 93°50'53", in SW¼NW¼NW¼ sec.4, T.108 N., R.25 W., Hydrologic Unit 07020011, at 1.3 mi (2.1 km) west of Madison Lake at waste treatment plant.
Owner: City of Madison Lake.
AQUIFER.--Prairie du Chien Group of Early Ordovician Age.
WELL CHARACTERISTICS.--Drilled domestic artesian well, diameter 6 in. (0.15 m), depth 313 ft (95.4 m), cased to 296 ft (90.2 m).
DATUM.--Altitude of land-surface datum is 1,036 ft (316 m). Measuring point: Top of casing, 1.60 ft (0.49 m) above land-surface datum.
PERIOD OF RECORD.--May 1979 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 92.52 ft (28.20 m) below land-surface datum, July 17, 1986; lowest, 95.42 ft (29.08 m) below land-surface datum, July 16, 1981.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Dec. 8	92.57	Feb. 11	92.55	Apr. 15	92.58	June 3	92.89	July 22	93.04	Sep. 23	93.14



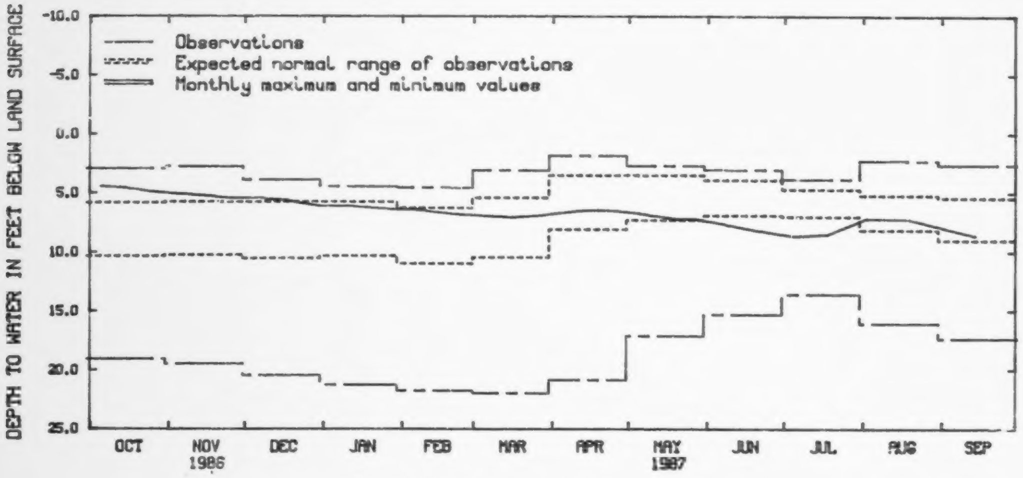
Ground-water levels, 1987 water year
Well 108N25W04BBC01

BROWN COUNTY

441030094254501. Local number, 108N30W09ADD01.
LOCATION.--Lat 44°10'30", long 94°25'45", in SE¼SE¼NE¼ sec.9, T.108 N., R.30 W., Hydrologic Unit 07020007, 3.7 mi (6.0 km) northeast of Hanska.
Owner: Erwin Kjelshus.
AQUIFER.--Deposits of Pleistocene Age.
WELL CHARACTERISTICS.--Bored unused water-table well, diameter 16 in. (0.41 m), depth 32 ft (9.8 m), cased to 32 ft (9.8 m), open end.
DATUM.--Altitude of land-surface datum is 1,003 ft (306 m). Measuring point: Top of concrete cover, at land-surface datum.
REMARKS.--Measured by Erwin Kjelshus. Water level used in monthly Water Resources Review.
PERIOD OF RECORD.--July 1942 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 1.82 ft (0.55 m) below land-surface datum, Apr. 28, 1986; lowest, 22.00 ft (6.71 m) below land-surface datum, Mar. 2, 1977.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct. 5	4.50	Nov. 15	5.26	Jan. 12	6.14	Mar. 16	7.10	May 5	6.78	July 5	8.70
13	4.59	25	5.50	28	6.43	26	6.90	19	7.22	18	8.50
21	4.81	Dec. 7	5.45	Feb. 6	6.44	Apr. 11	6.50	27	7.22	Aug. 2	7.15
26	4.96	18	5.70	20	6.82	19	6.43	June 7	7.66	19	7.26
Nov. 2	5.08	30	6.13	Mar. 4	6.97	27	6.58	18	8.14	Sep. 1	7.98
										14	8.67



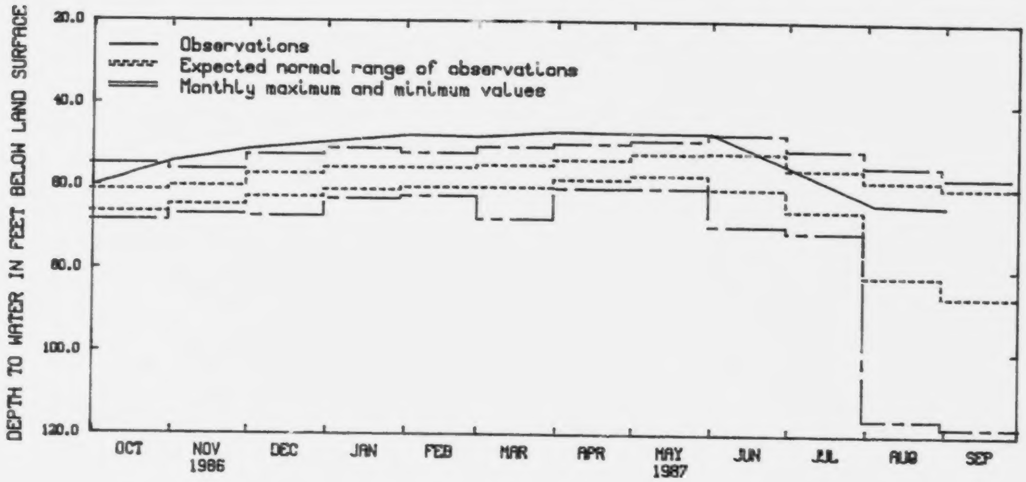
Ground-water levels, 1987 water year
Well 108N30W09ADD01

441800094434301. Local number, 110N32W30DDB01.
LOCATION.--Lat 44°18'00", long 94°43'43", in NW¼SE¼SE¼ sec.30, T.110 N., R.32 W., Hydrologic Unit 07020008, in Sleepy Eye at hospital.
Owner: City of Sleepy Eye.
AQUIFER.--Buried sand and gravel of Pleistocene Age.
WELL CHARACTERISTICS.--Drilled observation artesian well, diameter 2 in. (0.05 m), depth 176 ft (53.6 m).
DATUM.--Altitude of land-surface datum is 1,030 ft (314 m). Measuring point: Top of casing, 1.30 ft (0.40 m) above land-surface datum.
REMARKS.--Water level affected by pumping from nearby wells.
PERIOD OF RECORD.--August 1976 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 46.80 ft (14.26 m) below land-surface datum, Apr. 1, 1987; lowest, 118.1 ft (36.00 m) below land-surface datum, Sept. 15, 1976.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct. 1	60.10	Dec. 1	51.20	Feb. 2	47.70	Apr. 1	46.80	June 1	47.30	Aug. 4	64.20
Nov. 1	54.20	Jan. 14	48.70	Mar. 2	48.20	May 1	47.20	July 1	55.20	Sep. 1	64.70

BROWN COUNTY--Continued



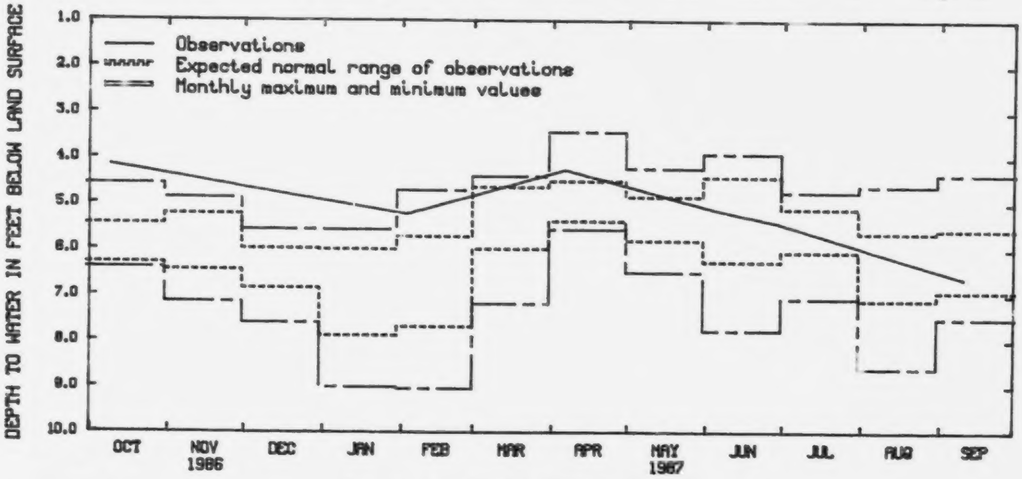
Ground-water levels, 1987 water year
Well 110N32W30DDB01

CHIPPEWA COUNTY

450447095490101. Local number, 119N41W29DDD01.
LOCATION.--Lat 45°04'47", long 95°40'01", in SE¼SE¼SE¼ sec.29, T.119 N., R.41 W., Hydrologic Unit 07020005, 5 mi (8.1 km) north of Watson.
Owner: U.S. Geological Survey.
AQUIFER.--Surficial sand and gravel of Pleistocene Age.
WELL CHARACTERISTICS.--Bored observation water-table well, diameter 1¼ in. (0.03 m), depth 19 ft (5.8 m), screened 17 to 19 ft (5.2 to 5.8 m).
DATUM.--Altitude of land-surface datum is 992 ft (302 m). Measuring point: Top of casing, 3.75 ft (1.14 m) above land-surface datum.
PERIOD OF RECORD.--September 1972 to February 1974, January 1977 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 3.43 ft (1.05 m) below land-surface datum, Apr. 10, 1984; lowest, 9.06 ft (2.76 m) below land-surface datum, Feb. 8, 1977.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct. 9	4.17	Feb. 3	5.24	Apr. 6	4.25	June 3	5.12	June 29	5.43	Sep. 10	6.64



Ground-water levels, 1987 water year
Well 119N41W29DDD01

CHIPPEWA COUNTY--Continued

450631095562201. Local number, 119N42W17DDD01.

LOCATION.--Lat 45°06'31", long 95°56'22", in SE¼SE¼SE¼ sec.17, T.119 N., R.42 W., Hydrologic Unit 07020001, west of Milan.

Owner: U.S. Geological Survey.

AQUIFER.--Surficial silt of Pleistocene Age.

WELL CHARACTERISTICS.--Bored observation water-table well, diameter 1¼ in. (0.03 m), depth 19 ft (5.8 m), screened 17 to 19 ft (5.2 to 5.8 m).

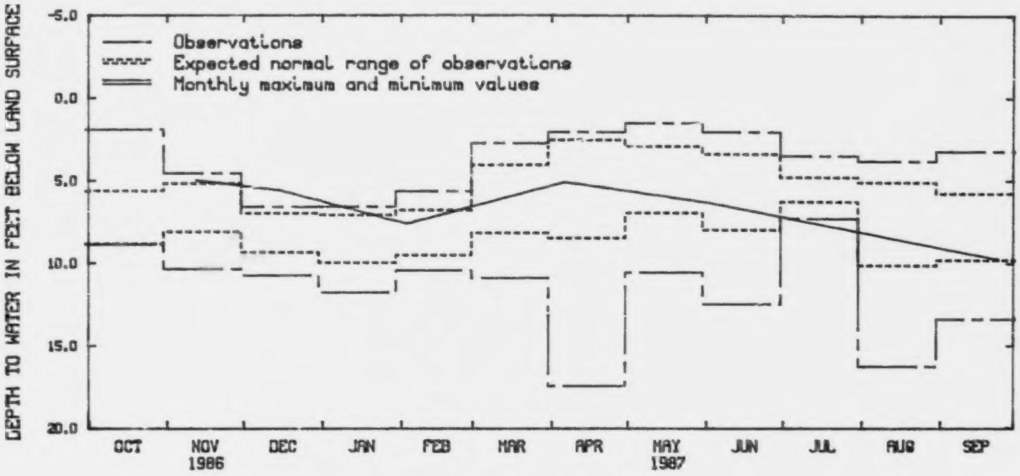
DATUM.--Altitude of land-surface datum is 1,027 ft (313 m). Measuring point: Top of casing, 4.50 ft (1.37 m) above land-surface datum.

PERIOD OF RECORD.--September 1972 to October 1973, April 1977 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level, 1.50 ft (0.46 m) below land-surface datum, May 7, 1973; lowest, 17.46 ft (5.32 m) below land-surface datum, Apr. 1, 1977.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Nov. 12	5.00	Dec. 16	5.64	Feb. 3	7.63	Apr. 6	5.08	June 3	6.40	Sep. 24	9.79



Ground-water levels, 1987 water year
Well 119N42W17DDD01

CHISAGO COUNTY

453125092445401. Local number, 035N19W17BDB01.

LOCATION.--Lat 45°31'25", long 92°44'54", in NW¼SE¼NW¼ sec.17, T.35 N., R.19 W., Hydrologic Unit 07030005, at Wild River State Park.

Owner: State of Minnesota.

AQUIFER.--Mount Simon Sandstone of Late Cambrian Age.

WELL CHARACTERISTICS.--Drilled domestic artesian well, diameter 6 in. (0.15 m), depth 270 ft (82.3 m), cased 230 ft (70.1 m).

DATUM.--Altitude of land-surface datum is 820 ft (250 m). Measuring point: Top of casing, 0.70 ft (0.21 m) above land-surface datum.

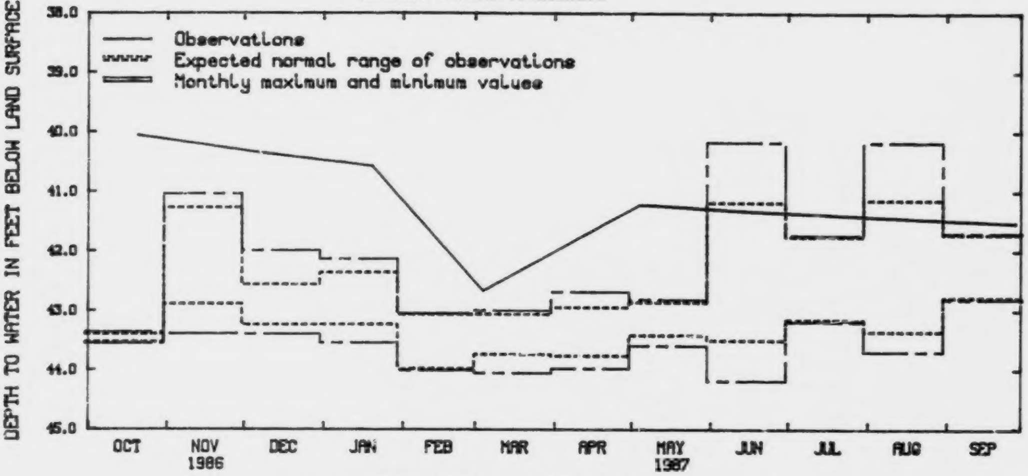
PERIOD OF RECORD.--October 1980 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level, 40.06 ft (12.21 m) below land-surface datum, Oct. 20, 1986; lowest, 44.19 ft (13.47 m) below land-surface datum, June 8, 1983.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct. 20	40.06	Jan. 20	40.59	May 4	41.22	June 15	41.34	Aug. 3	41.43	Sep. 28	41.54
Dec. 9	40.37	Mar. 4	42.68								

CHISAGO COUNTY..Continued



Ground-water levels, 1987 water year
Well 035N19W17BDB01

CROW WING COUNTY

463006094131201. Local number, 135N28W16CCD01.

LOCATION.--Lat 46°30'06", long 94°13'12", in SE¼SW¼SW¼ sec.16, T.135 N., R.28 W., Hydrologic Unit 07010106, northwest of Merrifield.

Owner: U.S. Geological Survey.

AQUIFER.--Surficial sand of Pleistocene Age.

WELL CHARACTERISTICS.--Bored observation water-table well, diameter 1¼ in. (0.03 m), depth 18 ft (5.5 m), screened 16 to 18 ft (4.9 to 5.5 m).

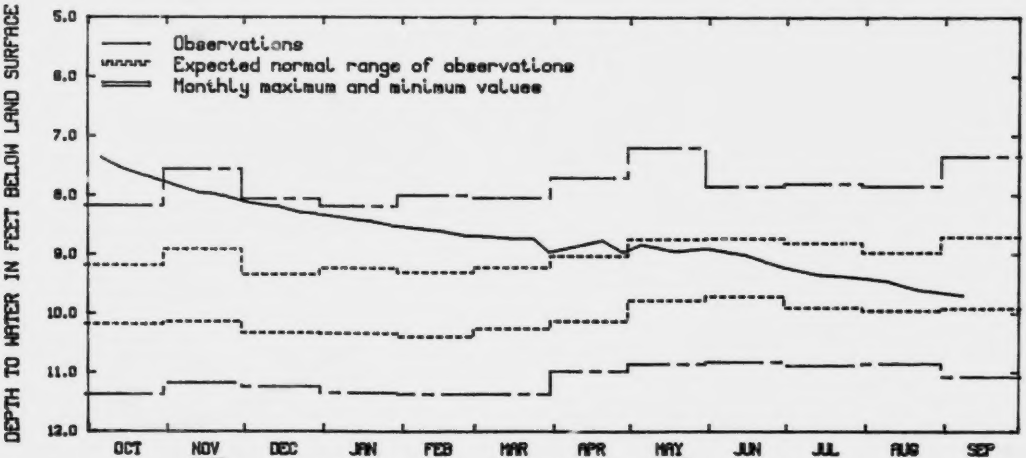
DATUM.--Altitude of land-surface datum is 1,212 ft (369 m). Measuring point: Top of casing, 2.00 ft (0.61 m) above land-surface datum.

PERIOD OF RECORD.--October 1970 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level, 7.20 ft (2.19 m) below land-surface datum, May 1, 1982; lowest, 11.38 ft (3.47 m) below land-surface datum, Oct. 16, 1970, Mar. 11, 1977.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct. 6	7.37	Nov. 24	8.02	Jan. 20	8.45	Mar. 15	8.74	May 18	8.96	July 13	9.35
13	7.53	Dec. 1	8.11	27	8.51	24	8.74	29	8.90	20	9.37
21	7.65	10	8.18	Feb. 4	8.56	30	8.97	June 1	8.90	Aug. 3	9.43
26	7.71	15	8.20	9	8.58	Apr. 20	8.76	8	8.97	10	9.47
Nov. 3	7.82	22	8.29	17	8.62	28	8.98	15	9.02	21	9.61
13	7.96	29	8.32	25	8.69	May 5	8.83	22	9.12	Sep. 8	9.71
18	7.97	Jan. 14	8.42	Mar. 7	8.71	12	8.90	29	9.22		



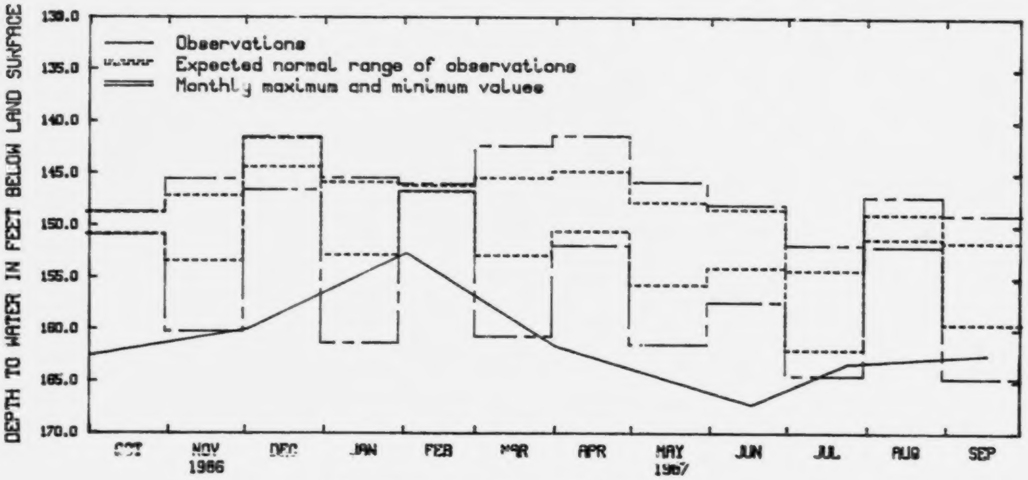
Ground-water levels, 1987 water year
Well 135N28W16CCD01

DAKOTA COUNTY

445044093102401. Local number, 027N23W09ABD01.
LOCATION.--Lat 44°50'44", long 93°10'24", in SE¼NW¼NE¼ sec.9, T.27 N., R.23 W., Hydrologic Unit 07020012, at Eagan.
Owner: City of Eagan, Timberline Addition.
AQUIFER.--Jordan Sandstone of Late Cambrian Age.
WELL CHARACTERISTICS.--Drilled public-supply artesian well, diameter 10 in. (0.25 m), depth 503 ft (153 m), cased to 401 ft (122 m).
DATUM.--Altitude of land-surface datum is 900 ft (274 m). Measuring point: Hole in well cap, 2.60 ft (0.79 m) above land-surface datum.
REMARKS.--Water-level affected by pumping.
PERIOD OF RECORD.--December 1965, April 1966, December 1966, March 1967, December 1970, August 1971, August 1977 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 141.40 ft (43.10 m) below land-surface datum, Apr. 5, 1966; lowest, 167.35 ft (51.00 m) below land-surface datum, June 17, 1987.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Dec. 2	159.99	Feb. 2	152.65	Apr. 1	161.69	June 17	167.35	July 24	163.33	Sep. 17	162.43



Ground-water levels, 1987 water year
Well 027N23W09ABD01

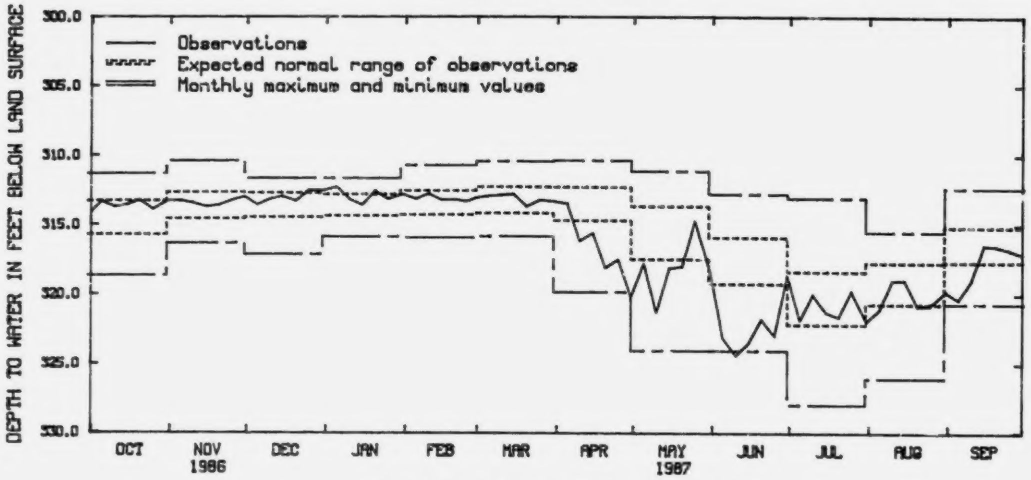
445330093054301. Local number, 028N22W19DCC02.
LOCATION.--Lat 44°53'30", long 93°05'43", in SW¼SW¼SE¼ sec.19, T.28 N., R.22 W., Hydrologic Unit 07010206, in West St. Paul.
Owner: U.S. Geological Survey, 2-N.
AQUIFER.--Prairie du Chien Group of Early Ordovician Age.
WELL CHARACTERISTICS.--Drilled observation artesian well, diameter 6 in. (0.15 m), depth 539 ft (164 m), cased to 407 ft (124 m).
DATUM.--Land-surface datum is 1,036 ft (316.0 m) National Geodetic Vertical Datum of 1929. Measuring point: Top of casing, 2.60 ft (0.79 m) above land-surface datum.
REMARKS.--Water-level affected by regional pumping.
PERIOD OF RECORD.--January 1971 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 309.8 ft (94.43 m) below land-surface datum, Mar. 7, 1983; lowest, 328.0 ft (99.97 m) below land-surface datum, July 31, 1975.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP
5	313.31	313.25	313.62	312.27	313.18	312.91	313.51	317.78	323.14	321.88	321.08	320.39
10	313.76	313.48	313.13	313.19	312.74	312.85	316.19	321.31	324.42	319.98	319.01	319.00
15	313.55	313.74	312.94	313.63	313.26	312.79	315.57	318.11	323.48	321.30	318.97	316.44
20	313.21	313.59	313.34	312.58	313.19	313.73	318.11	317.88	321.78	321.68	320.85	316.54
25	313.93	313.23	312.52	313.18	313.36	313.22	317.48	314.72	322.99	319.74	320.78	316.80
EOM	313.26	312.96	312.58	312.79	313.08	313.35	320.20	318.37	318.60	321.97	319.77	317.14

WTR YEAR 1987 HIGHEST 311.71 FEB 23, 1987 LOWEST 324.42 JUN 10, 1987

DAKOTA COUNTY--Continued

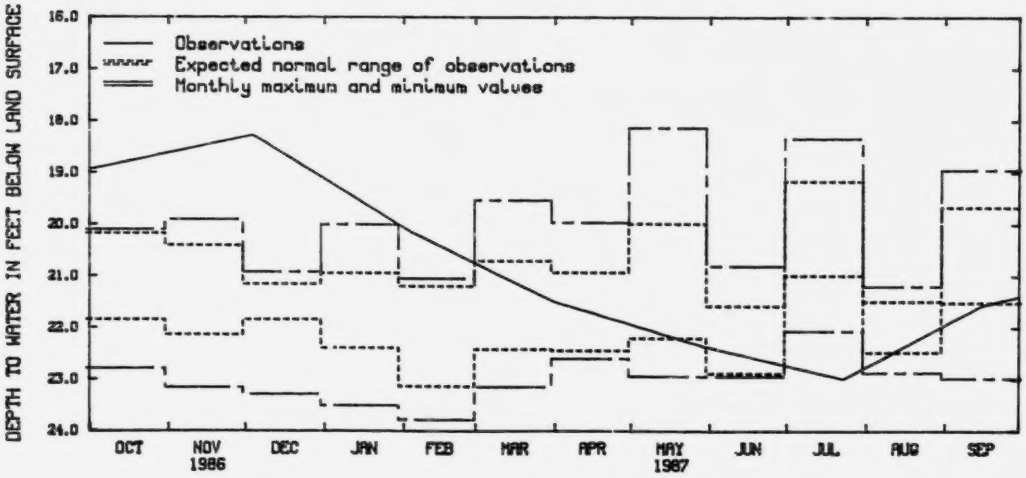


Ground-water levels, 1987 water year
Well 028N22W19DCC02

443146093002201. Local number, 112N18W08ABA01.
LOCATION.--Lat 44°31'46", long 93°00'22", in NE¼NW¼NE¼ sec.8, T.112 N., R.18 W., Hydrologic Unit 07040002, northeast of Randolph.
Owner: U.S. Geological Survey
AQUIFER.--Surficial outwash sand and gravel of Pleistocene Age.
WELL CHARACTERISTICS.--Bored observation water-table well, diameter 1¼ in. (0.03 m), depth 44 ft (13.4 m), screened 42 to 44 ft (12.8 to 13.4 m).
DATUM.--Altitude of land-surface datum is 880 ft (268 m). Measuring point: Top of casing, 3.40 ft (1.04 m) above land-surface datum.
PERIOD OF RECORD.--April 1977 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 18.13 ft (5.53 m) below land-surface datum, May 3, 1983; lowest, 23.80 ft (7.25 m) below land-surface datum, Feb. 21, 1979.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Dec. 4	18.27	Feb. 3	20.14	Mar. 31	21.49	May 28	22.35	July 23	23.00	Sep. 15	21.57



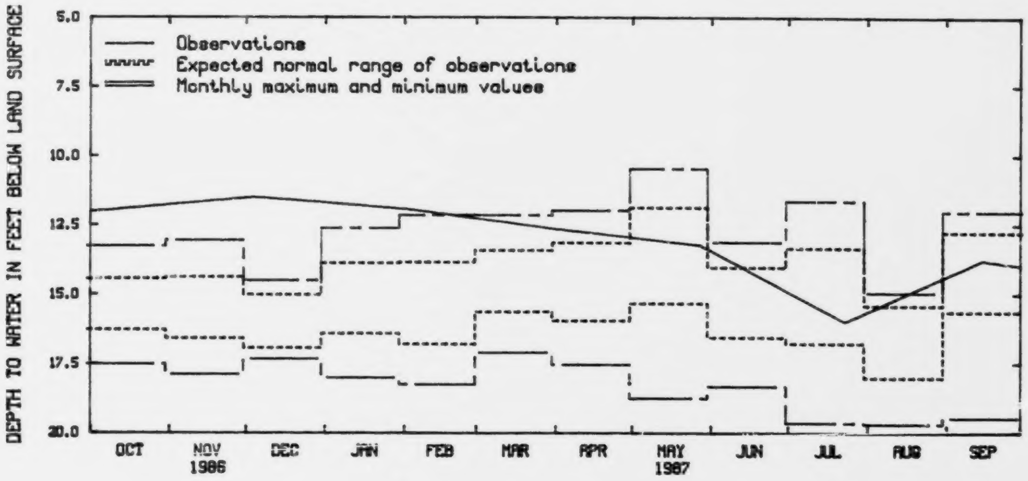
Ground-water levels, 1987 water year
Well 112N18W08ABA01

DAKOTA COUNTY--Continued

443134093010601. Local number, 112N18W08BBC01.
LOCATION.--Lat 44°31'34", long 93°01'06", in SW¼NW¼NW¼ sec.8, T.112 N., R.18 W., Hydrologic Unit 07040002, at Randolph Fire Station.
Owner: City of Randolph.
AQUIFER.--Prairie du Chien Group of Early Ordovician Age.
WELL CHARACTERISTICS.--Drilled fire protection artesian well, diameter 10 in. (0.25 m), depth 150 ft (45.7 m), cased to 64 ft (19.5 m).
DATUM.--Altitude of land-surface datum is 883 ft (269 m). Measuring point: Top of 3/4-inch (0.02 m) breather pipe, 2.20 ft (0.67 m) above land-surface datum.
PERIOD OF RECORD.--July 1973 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 10.47 ft (3.19 m) below land-surface datum, May 3, 1983; lowest, 19.70 ft (6.00 m) below land-surface datum, Aug. 11, 1977.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Dec. 4	11.49	Feb. 3	11.96	Mar. 31	12.65	May 28	13.26	July 23	16.02	Sep. 15	13.77



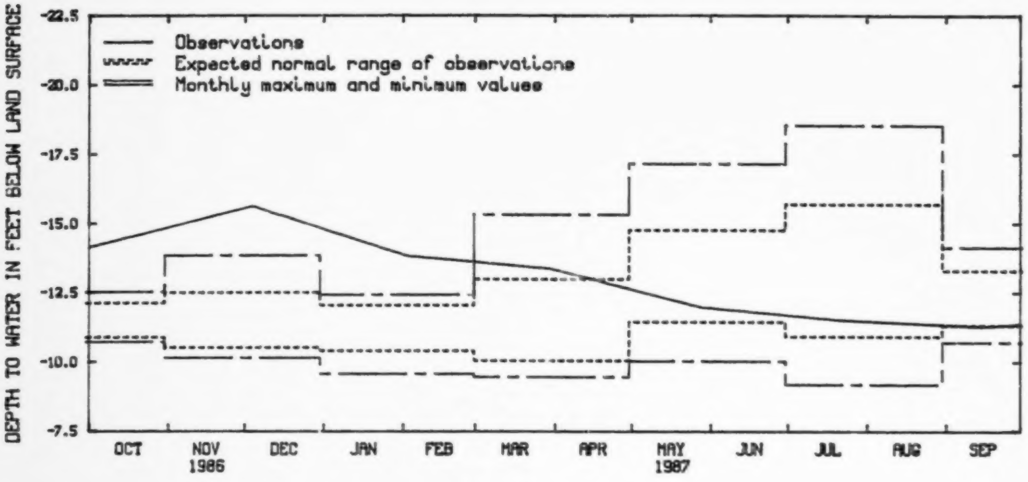
Ground-water levels, 1987 water year
Well 112N18W08BBC01

442830093085201. Local number, 112N19W30DBD01.
LOCATION.--Lat 44°28'30", long 93°08'52", in SE¼NW¼SE¼ sec.30, T.112 N., R.19 W., Hydrologic Unit 07040002, at Northfield waste treatment plant.
Owner: City of Northfield.
AQUIFER.--Jordan Sandstone of Late Cambrian Age.
WELL CHARACTERISTICS.--Drilled domestic artesian well, diameter 6 in. (0.15 m), depth 275 ft (83.8 m), cased to 212 ft (64.6 m).
DATUM.--Altitude of land-surface datum is 890 ft (271 m). Measuring point: Center of pressure guage, 2.05 ft (0.62 m) above land-surface datum.
PERIOD OF RECORD.--May 1979 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 18.54 ft (5.65 m) above land-surface datum, July 12, 1983; lowest, 9.19 ft (2.80 m) above land-surface datum, July 10, 1985.

WATER LEVEL, IN FEET ABOVE LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Dec. 4	15.63	Feb. 3	13.79	Mar. 31	13.33	May 28	11.95	July 21	11.49	Sep. 15	11.26

DAKOTA COUNTY--Continued

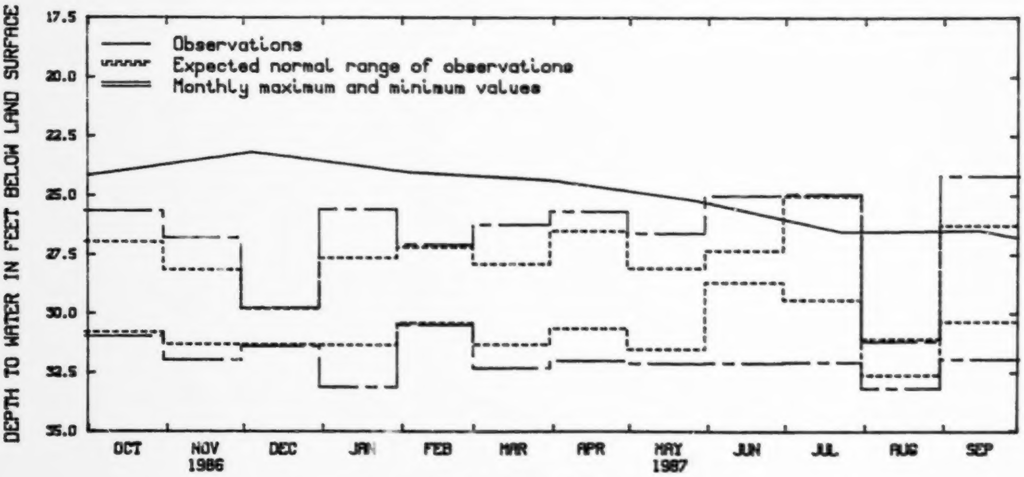


Ground-water levels, 1987 water year
Well 112N19W30DBD01

443645093014701. Local number, 113N18W07BAC01.
LOCATION.--Lat 44°36'45", long 93°01'47", in SW¼NE¼NW¼ sec.7, T.113 N., R.18 W., Hydrologic Unit 07040001, west of Hampton.
Owner: Eugene Dohmen.
AQUIFER.--Prairie du Chien Group of Early Ordovician Age and Jordan Sandstone of Late Cambrian Age.
WELL CHARACTERISTICS.--Drilled irrigation artesian well, diameter 16 in. (0.41 m), depth 325 ft (99.1 m), cased to 65 ft (19.8 m).
DATUM.--Altitude of land-surface datum is 915 ft (217 m). Measuring point: Hole in pump base, 1.60 ft (0.49 m) above land-surface datum.
PERIOD OF RECORD.--April 1977 to August 1977, January 1978, June 1979 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 23.15 ft (7.05 m) below land-surface datum, Dec. 4, 1986; lowest, 33.19 ft (10.12 m) below land-surface datum, Aug. 12, 1977.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Dec. 4	23.15	Feb. 3	24.03	Mar. 31	24.37	May 28	25.24	July 23	26.56	Sep. 15	26.46



Ground-water levels, 1987 water year
Well 113N18W07BAC01

DAKOTA COUNTY--Continued

444205092500001. Local number, 114N17W10AAA01.

LOCATION.--Lat 44°42'05", long 92°50'00", in NE¼NE¼NE¼ sec.10, T.114 N., R.17 W., Hydrologic Unit 07040001, southeast of Hastings.

Owner: John Conzemius.

AQUIFER.--Prairie du Chien Group of Early Ordovician Age.

WELL CHARACTERISTICS.--Drilled unused artesian well, diameter 4 in. (0.10 m), depth 151 ft (46.0 m), depth of casing unknown.

DATUM.--Altitude of land-surface datum is 827 ft (252 m). Measuring point: Top of platform, 2.50 ft (0.76 m) above land-surface datum.

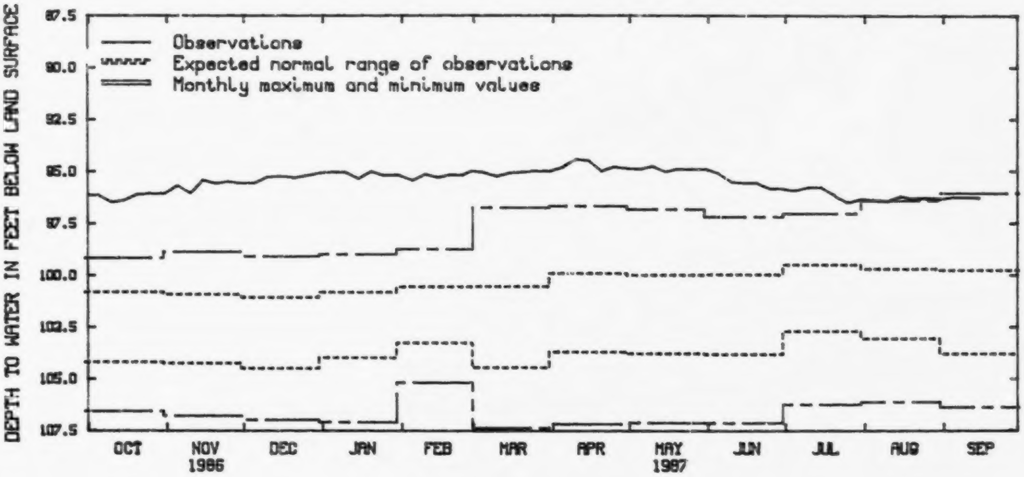
PERIOD OF RECORD.--April 1976 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level, 94.10 ft (28.68 m) below land-surface datum, Mar. 31, 1987; lowest, 107.4 ft (32.74 m) below land-surface datum, Mar. 12, 1978.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP
5	96.16	95.66	95.58	95.01	95.45	95.07	94.78	94.93	95.14	95.96	96.43	96.23
10	96.50	96.09	95.27	95.06	95.12	95.26	94.40	94.74	95.54	95.76	96.47	96.27
15	96.39	95.41	95.21	95.37	95.31	95.06	94.50	95.05	95.60	95.77	96.21	96.30
20	96.11	95.60	95.33	94.99	95.15	95.02	95.01	94.88	95.57	96.18	96.35	
25	96.05	95.48	95.21	95.22	95.16	94.96	94.77	94.90	95.87	96.53	96.29	
EOM	96.09	95.59	95.06	95.11	94.97	95.00	94.88	94.91	95.86	96.34	96.36	

WTR YEAR 1987 HIGHEST 94.10 MAR 31, 1987 LOWEST 96.74 OCT. 9, 1986



Ground-water levels, 1987 water year
Well 114N17W10AAA01

444047092521901. Local number, 114N17W16CBB01.

LOCATION.--Lat 44°40'47", long 92°52'19", in NW¼NW¼SW¼ sec.16, T.114 N., R.17 W., Hyrologic Unit 07040001, Kirby Avenue, 0.5 mi (0.8 km) north of 190th Street.

Owner: Jim Huneke Construction Company.

AQUIFER.--Surficial sand and gravel of Pleistocene Age.

WELL CHARACTERISTICS.--Drilled domestic water-table well, diameter 4 in. (0.10 m), depth 170 ft (51.8 m), screened 164 to 170 ft (50.0 to 51.8 m).

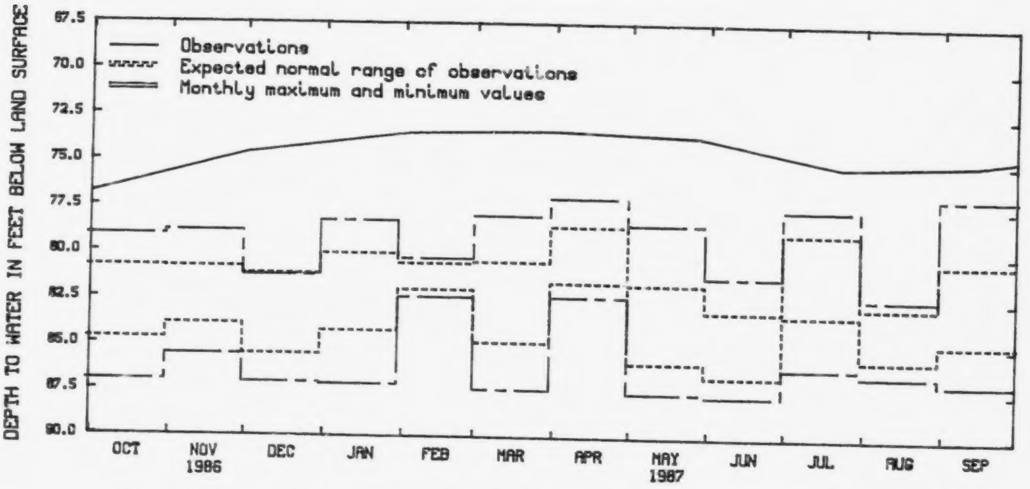
DATUM.--Altitude of land-surface datum is 823 ft (251 m). Measuring point: Top of casing, 1.10 ft (0.34 m) above land-surface datum.

PERIOD OF RECORD.--March 1976, March 1977 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level, 73.32 ft (22.34 m) below land-surface datum, Mar. 31, 1987; lowest, 87.75 ft (26.75 m) below land-surface datum, June 27, 1978.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Dec. 1	74.59	Feb. 3	73.47	Mar. 31	73.32	May 28	73.66	July 23	75.22	Sep. 15	74.90

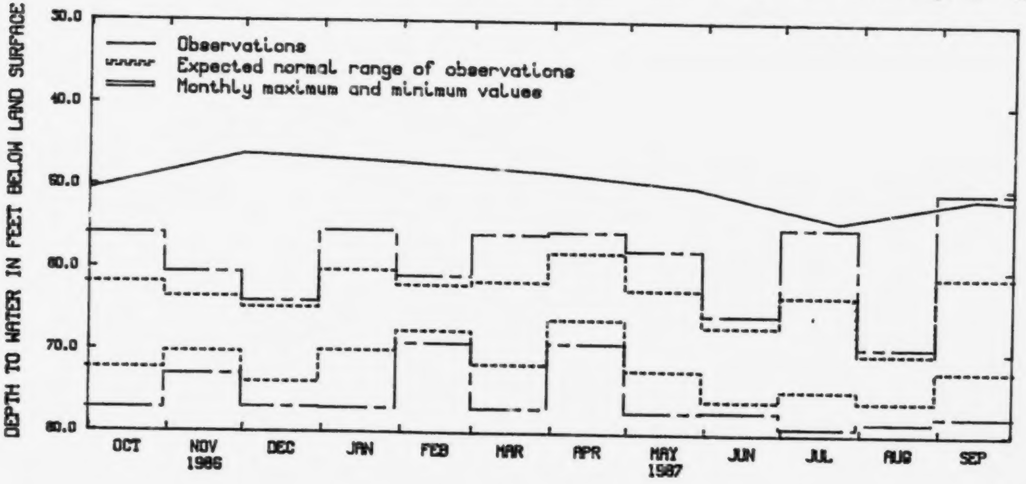


Ground-water levels, 1987 water year
Well 114N17W16CBB01

443827092521801. Local number, 114N17W33BBC01.
LOCATION.--Lat 44°38'27", long 92°52'18", in SW¼NW¼NW¼ sec.33, T.114 N., R.17 W., Hydrologic Unit 07040001, 39 ft (11.9 m) south of irrigation well.
Owner: Rainer Kimmes.
AQUIFER.--Prairie du Chien Group of Early Ordovician Age.
WELL CHARACTERISTICS.--Drilled unused water-table well, diameter 16 in. (0.41 m), depth 290 ft (88.4 m), cased to 25 ft (7.6 m).
DATUM.--Altitude of land-surface datum is 862 ft (263 m). Measuring point: Hole in plate over well, 2.00 ft (0.61 m) above land-surface datum.
PERIOD OF RECORD.--August 1977 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 46.14 ft (14.06 m) below land-surface datum, Dec. 1, 1986; lowest, 79.20 ft (24.14 m) below land-surface datum, July 11, 1985.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Dec. 1	46.14	Feb. 3	47.24	Mar. 31	48.42	May 28	50.18	July 23	54.19	Sep. 15	51.15



Ground-water levels, 1987 water year
Well 114N17W33BBC01

DAKOTA COUNTY--Continued

444117092595701. Local number, 114N18W17AAB01.
LOCATION.--Lat 44°41'17", long 92°59'57", in NW¼NE¼NE¼ sec.17, T.114 N., R.18 W., Hydrologic Unit 07040001, 180th Street, 0.25 mi (0.40 km) west of Emery Avenue.
Owner: Joe Ries.
AQUIFER.--Prairie du Chien Group of Early Ordovician Age and Jordan Sandstone of Late Cambrian Age.
WELL CHARACTERISTICS.--Drilled irrigation artesian well, diameter 16 in. (0.41 m), depth 280 ft (85.3 m), cased to 39 ft (11.9 m).
DATUM.--Altitude of land-surface datum is 905 ft (276 m). Measuring point: Edge of vent pipe, 1.40 ft (0.43 m) above land-surface datum.
PERIOD OF RECORD.--June 1979 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 57.30 ft (17.46 m) below land-surface datum, Dec. 1, 1986; lowest, 73.52 ft (22.41 m) below land-surface datum, Sept. 13, 1982.

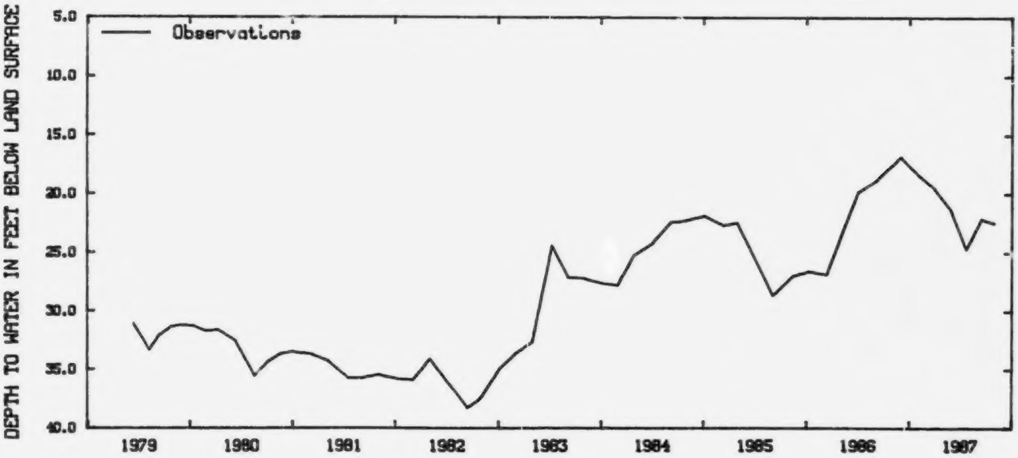
WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Dec. 1	57.30	Feb. 3	58.80	Mar. 31	59.89	May 28	62.12	Sep. 15	61.35

443801092571301. Local number, 114N18W35CCB01.
LOCATION.--Lat 44°38'01", long 92°57'13", in NW¼SW¼SW¼ sec.35, T.114 N., R.18 W., Hydrologic Unit 07040001, Goodwin Avenue, 1.1 mi (1.8 km) south of Northfield Boulevard.
Owner: Al Wagner, Jr.
AQUIFER.--Buried gravel of Pleistocene Age.
WELL CHARACTERISTICS.--Driled irrigation artesian well, diameter 12 in. (0.30 m), depth 203 ft (61.9 m), screened 173 to 203 ft (52.7 to 61.9 m).
DATUM.--Altitude of land-surface datum is 898 ft (274 m). Measuring point: Hole in pump base, 1.25 ft (0.38 m) above land-surface datum.
PERIOD OF RECORD.--June 1979 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 16.83 ft (5.12 m) below land-surface datum, Dec. 1, 1986; lowest, 38.28 ft (11.67 m) below land-surface datum, Sept. 13, 1982.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Dec. 1	16.83	Feb. 3	18.42	Mar. 31	19.55	May 28	21.38	July 23	24.72	Sep. 15	22.11

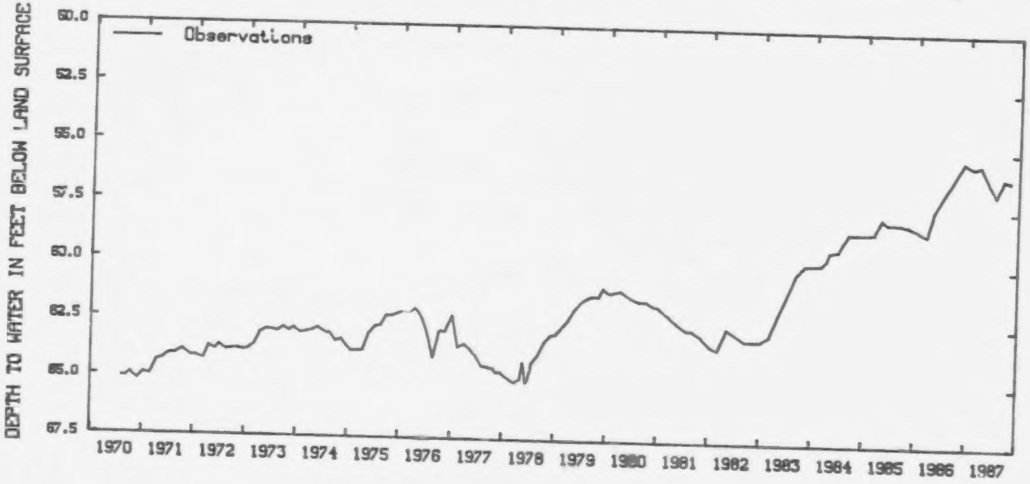


Ground-water levels, 1979-87
Well 114N18W35CCB01

444220093055001. Local number, 114N19W04DAC01.
LOCATION.--Lat 44°42'20", long 93°05'50", in SW¼NE¼SE¼ sec.4, T.114 N., R.19 W., Hydrologic Unit 07040001, 2.1 mi (3.4 km) southeast of Rosemount.
Owner: University of Minnesota Agricultural Experiment Station (Plant Pathology).
AQUIFER.--Jordan Sandstone of Late Cambrian Age.
WELL CHARACTERISTICS.--Drilled irrigation artesian well, diameter 6 in. (0.15 m), depth 415 ft (126 m), cased to 355 ft (108 m).
DATUM.--Altitude of land-surface datum is 947 ft (289 m). Measuring point: Top of 1-inch breather pipe, 2.10 ft (0.64 m) above land-surface datum.
PERIOD OF RECORD.--August 1970 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 55.36 ft (16.87 m) below land-surface datum, Dec. 1, 1986; lowest, 65.23 ft (19.88 m) below land-surface datum, Nov. 27, 1970.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Dec. 1	55.36	Feb. 3	55.60	Mar. 31	55.49	June 3	56.26	July 24	56.78	Sep. 15	56.04

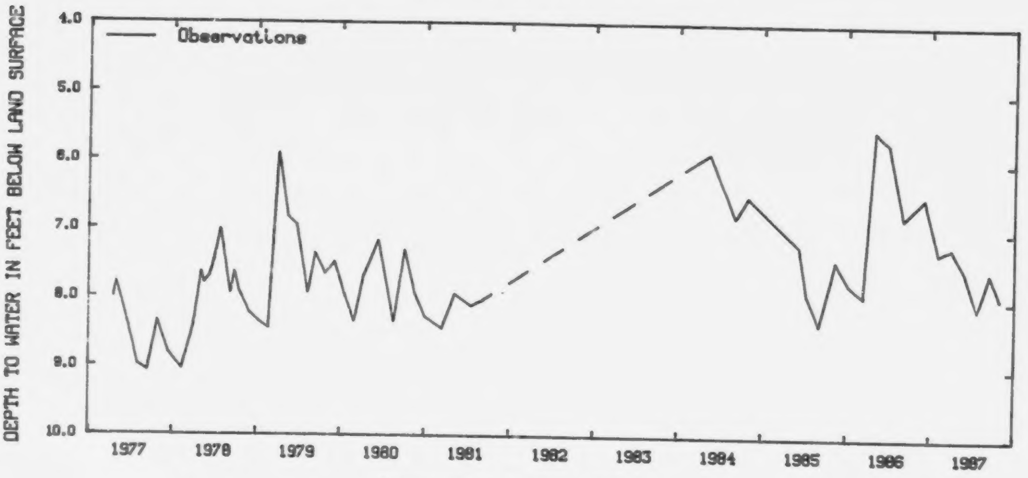


Ground-water levels, 1970-87
Well 114N19W04DAC01

443934093043201. Local number, 114N19W22DDD01.
LOCATION.--Lat 44°39'34", long 93°04'32", in SE¼SE¼SE¼ sec.22, T.114 N., R.19 W., Hydrologic Unit 07040001, west of Empire.
Owner: U.S. Geological Survey.
AQUIFER.--Surficial outwash sand and gravel of Pleistocene Age.
WELL CHARACTERISTICS.--Bored observation water-table well, diameter 1¼ in. (0.03 m), depth 24 ft (7.3 m), screened 22 to 24 ft (6.7 to 7.3 m).
DATUM.--Altitude of land-surface datum is 875 ft (267 m). Measuring point: Top of casing, 3.00 ft (0.91 m) above land-surface datum.
PERIOD OF RECORD.--April 1977 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 5.52 ft (1.68 m) below land-surface datum, May 2, 1986; lowest, 9.08 ft (2.76 m) below land-surface datum, Sept.12, 1977.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Dec. 4	6.49	Feb. 3	7.30	Mar. 31	7.21	May 28	7.56	July 23	8.12	Sep. 15	7.57



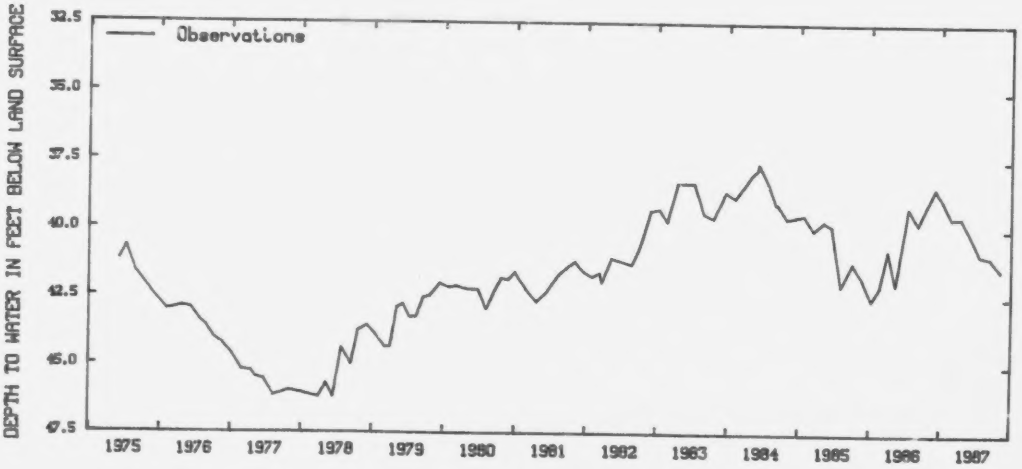
Ground-water levels, 1977-87
Well 114N19W22DDD01

DODGE COUNTY

435336092553201. Local number, 105N18W13DDD01.
LOCATION.--Lat 43°53'36", long 92°55'32", in SE¼SE¼SE¼ sec.13, T.105 N., R.18 W., Hydrologic Unit 07080201, 3 mi (4.8 km) west of Hayfield.
Owner: James Barry.
AQUIFER.--Buried sand and gravel of Pleistocene Age.
WELL CHARACTERISTICS.--Drilled unused artesian well, diameter 5 in. (0.13 m), depth 82 ft (25.0 m), screen information not available.
DATUM.--Altitude of land-surface datum is 1,288 ft (393 m). Measuring point: Top of casing, 1.80 ft (0.55 m) above land-surface datum.
PERIOD OF RECORD.--June 1975 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 37.61 ft (11.46 m) below land-surface datum, June 6, 1984; lowest, 46.25 ft (14.10 m) below land-surface datum, Mar. 30, 1978.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Dec. 3	38.46	Feb. 25	39.57	Apr. 16	39.52	June 16	40.35	July 21	40.90	Sep. 15	41.00
Jan. 8	38.90										



Ground-water levels, 1975-87
Well 105N18W13DDD01

DODGE COUNTY--Continued

440448092485501. Local number, 107N17W13BBA01.

LOCATION.--Lat 44°04'48", long 92°48'55", in NE¼NW¼NW¼ sec.13, T.107 N., R.17 W., Hydrologic Unit 07040004, in city of Wasioja.
Owner: Wasioja Township Garage.

AQUIFER.--Galena Formation of Middle Ordovician Age.

WELL CHARACTERISTICS.--Drilled maintenance artesian well, diameter 6 in. (0.15 m), depth 100 ft (30.5 m), cased to 52 ft (15.8 m).

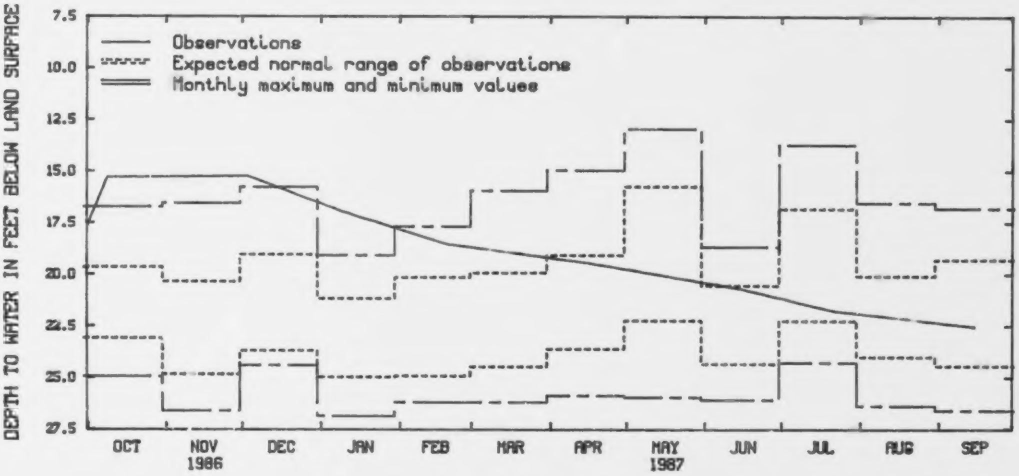
DATUM.--Altitude of land-surface datum is 1,185 ft (361 m). Measuring point: Top of casing, 1.60 ft (0.49 m) above land-surface datum.

PERIOD OF RECORD.--January 1975 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level, 12.94 ft (3.94 m) below land-surface datum, May 23, 1983; lowest, 26.88 ft (8.19 m) below land-surface datum, Jan. 5, 1978.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct. 9	15.30	Jan. 8	16.92	Apr. 16	19.47	June 16	20.74	July 21	21.78	Sep. 15	22.57
Dec. 3	15.22	Feb. 19	18.55								



Ground-water levels, 1987 water year
Well 107N17W13BBA01

FARIBAULT COUNTY

434237094082901. Local number, 103N28W24BDC01.

LOCATION.--Lat 43°42'37", long 94°08'29", in SW¼SE¼NW¼ sec.24, T.103 N., R.28 W., Hydrologic Unit 07020009, 4.5 mi (7.2 km) south of Winnebago.
Owner: Riverside Town and Country Club.

AQUIFER.--Prairie du Chien Group of Early Ordovician Age.

WELL CHARACTERISTICS.--Drilled irrigation artesian well, diameter 8 in. (0.20 m), depth 352 ft (107 m), cased to 291 ft (88.7 m).

DATUM.--Altitude of land-surface datum is 1,085 ft (331 m). Measuring point: Top of coupling, 1.50 ft (0.46 m) above land-surface datum.

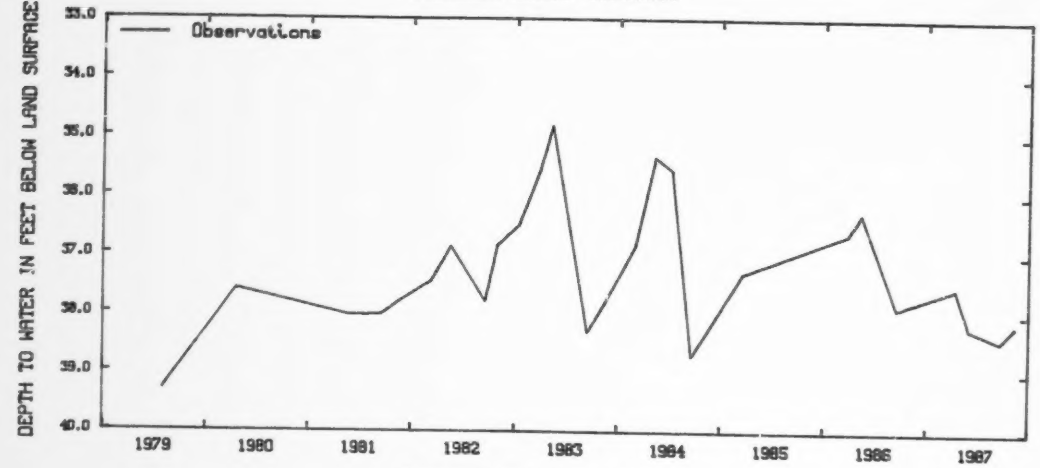
PERIOD OF RECORD.--July 1979, April 1980, May 1981 to current year.

EXTREMES FOR PERIODS OF RECORD.--Highest water level, 34.82 ft (10.61 m) below land-surface datum, May 10, 1983; lowest, 39.30 ft (11.98 m) below land-surface datum, July 31, 1979.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Apr. 14	37.54	June 2	38.22	Sep. 22	38.44

FARIBAULT COUNTY--Continued

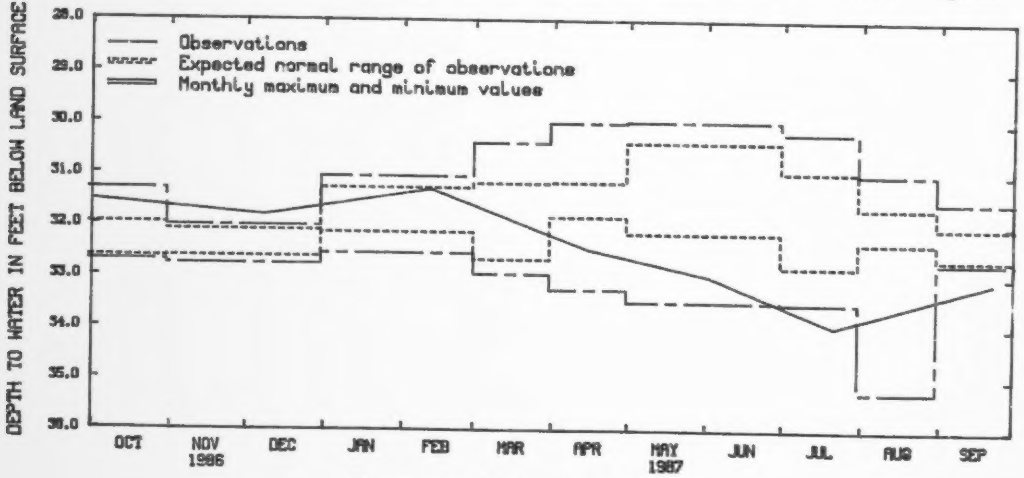


Ground-water levels, 1979-87
Well 103N28W24BDC01

434558093540001. Local number, 104N26W36CAC01.
LOCATION.--Lat 43°45'58", long 93°54'00", in SW¼NE¼SW¼ sec.36, T.104 N., R.26 W., Hydrologic Unit 07020011, at Easton Creamery.
Owner: City of Easton.
AQUIFER.--Platteville Formation of Middle Ordovician Age.
WELL CHARACTERISTICS.--Drilled public supply artesian well, diameter 6 in. (0.15 m), depth 145 ft (44.2 m), cased to 120 ft (36.6 m).
DATUM.--Altitude of land-surface datum is 1,060 ft (323 m). Measuring point: Top of well cap, 1.20 ft (0.37 m) above land-surface datum.
PERIOD OF RECORD.--August 1979, April 1980, May 1981 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 29.97 ft (9.13 m) below land-surface datum, May 10, 1983; lowest, 35.25 ft (10.74 m) below land-surface datum, Aug. 1, 1979.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Dec. 8	31.82	Feb. 12	31.30	Apr. 14	32.46	June 2	33.00	July 21	33.98	Sep. 22	33.09



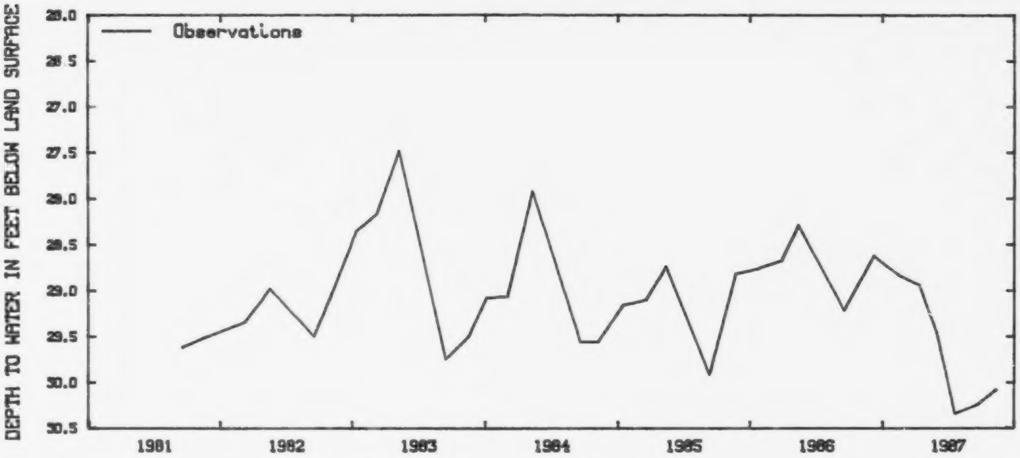
Ground-water levels, 1987 water year
Well 104N26W36CAC01

FARIBAULT COUNTY--Continued

434902094042901. Local number, 104N27W16ABA01.
LOCATION.--Lat 43°49'02", long 94°04'29", in NE¼NW¼NE¼ sec.16, T.104 N., R.27 W., Hydrologic Unit 07020011, at Bass Lake Baptist Camp.
Owner: Baptist Church.
AQUIFER.--St. Peter Sandstone of Middle Ordovician Age.
WELL CHARACTERISTICS.--Drilled domestic artesian well, diameter 4 in. (0.10 m), depth 240 ft (73.2 m), cased to 190 ft (57.9 m).
DATUM.--Altitude of land-surface datum is 1,050 ft (320 m). Measuring point: Hole in well cap, 0.90 ft (0.27 m) above land-surface datum.
PERIOD OF RECORD.--September 1981 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 27.48 ft (8.38 m) below land-surface datum, May 10, 1983; lowest, 30.35 ft (9.25 m) below land-surface datum, July 21, 1987.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Dec. 8	28.62	Feb. 12	28.83	Apr. 14	28.95	June 2	29.48	July 21	30.35	Sep. 22	30.24



Ground-water levels, 1981-87
Well 104N27W16ABA01

FREEBORN COUNTY

433434093331201. Local number, 101N23W02DAC01.
LOCATION.--Lat 43°34'34", long 93°33'12", in SW¼NE¼SE¼ sec.2, T.101 N., R.23 W., Hydrologic Unit 07080203, 3 mi (4.8 km) southwest of Conger.
Owner: Richard Steele.
AQUIFER.--Upper Carbonates of Devonian and Ordovician Age.
WELL CHARACTERISTICS.--Drilled irrigation artesian well, diameter 16 in. (0.41 m), depth 373 ft (114 m), cased to 156 ft (47.6 m).
DATUM.--Aaltitude of land-surface datum is 1,280 ft (390 m). Measuring point: Vent pipe, 1.50 ft (0.46 m) above land-surface datum.
PERIOD OF RECORD.--July 1981 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 65.58 ft (19.99 m) below land-surface datum, Mar. 8, 1983; lowest, 70.66 ft (21.53 m) below land-surface datum, July 21, 1987.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

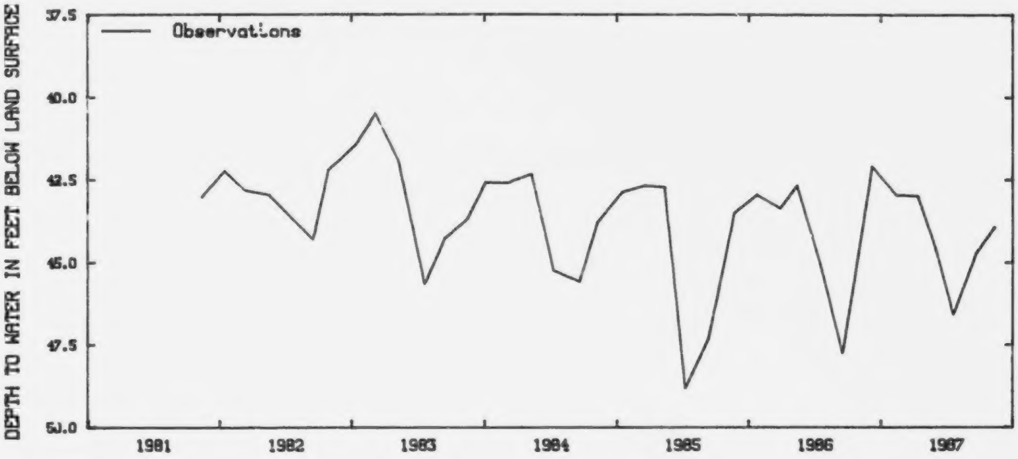
DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Dec. 8	67.45	Feb. 12	68.30	Apr. 14	68.37	June 2	69.17	July 21	70.66	Sep. 22	70.29

FREEBORN COUNTY--Continued

433846093220601. Local number, 102N21W09CCB01.
LOCATION.--Lat 43°38'46", long 93°22'06", in NW¼SW¼SW¼ sec.9, T.102 N., R.21 W., Hydrologic Unit 07080202, at Freeborn County Courthouse.
Owner: Freeborn County.
AQUIFER.--Cedar Valley Formation of Middle Devonian Age.
WELL CHARACTERISTICS.--Drilled public supply artesian well, diameter 5 in. (0.13 m), depth 150 ft (45.7 m), cased to 138 ft (42.1 m).
DATUM.--Altitude of land-surface datum is 1,240 ft (378 m). Measuring point: Top of casing, 1.00 ft (0.30 m) above land-surface datum.
PERIOD OF RECORD.--November 1981 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 40.50 ft (12.34 m) below land-surface datum, Mar. 8, 1983; lowest, 48.62 ft (14.88 m) below land-surface datum, July 10, 1985.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Dec. 8	42.09	Feb. 12	42.97	Apr. 14	43.01	June 2	44.58	July 21	46.59	Sep. 22	44.73



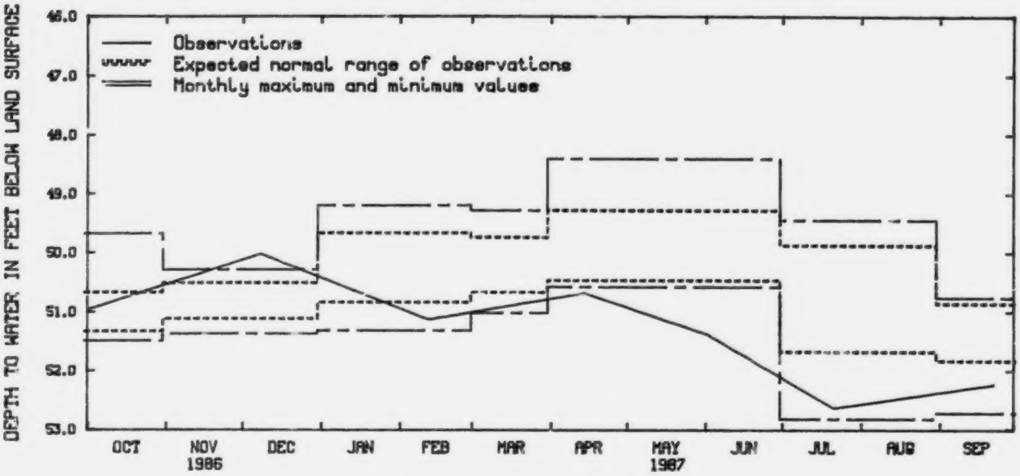
Ground-water levels, 1981-87
Well 102N21W09CCB01

434032093111801. Local number, 103N20W36CCB01.
LOCATION.--Lat 43°40'32", long 93°11'18", in NE¼SW¼SW¼ sec.36, T.103 N., R.20 W., Hydrologic Unit 07080201, at Pillsbury Grain Station.
Owner: Pillsbury Co.
AQUIFER.--Cedar Valley Formation of Middle Devonian Age.
WELL CHARACTERISTICS.--Drilled domestic artesian well, diameter 5 in. (0.13 m), depth 231 ft (70.4 m), cased to 136 ft (41.4 m).
DATUM.--Altitude of land-surface datum is 1,255 ft (383 m). Measuring point: Top of casing, 1.80 ft (0.55 m) above land-surface datum.
PERIOD OF RECORD.--July 1981 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 48.40 ft (14.75 m) below land-surface datum, May 10, 1984; lowest, 52.82 ft (12.09 m) below land-surface datum, July 10, 1985.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Dec. 8	50.02	Feb. 12	51.14	Apr. 14	50.68	June 2	51.40	July 21	52.64	Sep. 22	52.23

FREEBORN COUNTY--Continued



Ground-water levels, 1987 water year
Well 103N20W36CCB01

434308093322001. Local number, 103N23W13CDA01.

LOCATION.--Lat 43°43'08", long 93°32'20", in NE¼SE¼SW¼ sec.13, T.103 N., R.23 W., Hydrologic Unit 07020011, 3.3 mi (5.3 km) northeast of Alden.

Owner: Oakview Golf Course.

AQUIFER.--Galena Formation of Middle Ordovician Age.

WELL CHARACTERISTICS.--Drilled irrigation artesian well, diameter 6 in. (0.15 m), depth 270 ft (82.3 m), cased to 158 ft (48.2 m).

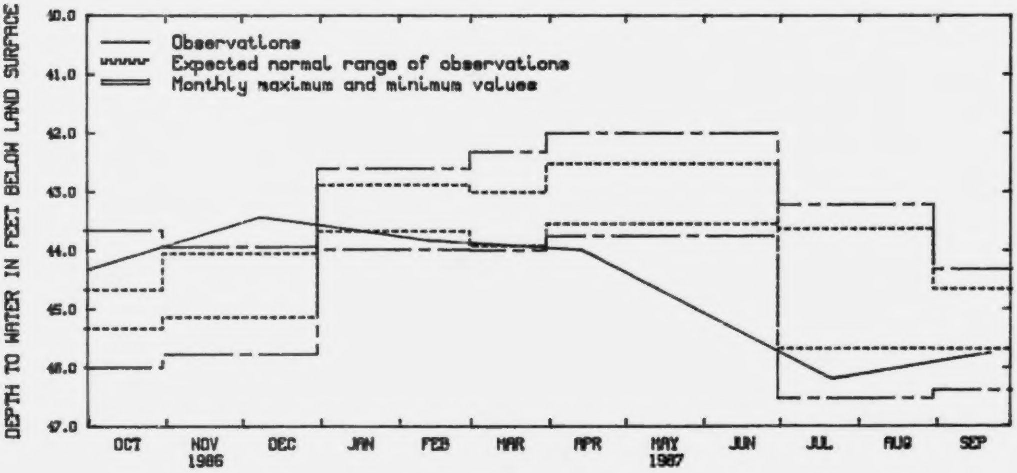
DATUM.--Altitude of land-surface datum is 1,250 ft (381 m). Measuring point: Hole in well cap, 1.90 ft (0.58 m) above land-surface datum.

PERIOD OF RECORD.--July 1981 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level, 42.00 ft (12.80 m) below land-surface datum, May 10, 1983; lowest, 46.53 ft (14.18 m) below land-surface datum, July 10, 1985.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Dec. 8	43.42	Feb. 12	43.83	Apr. 14	44.00	July 21	46.20	Sep. 22	45.75



Ground-water levels, 1987 water year
Well 103N23W13CDA01

GOODHUE COUNTY

441737092400501. Local number, 110N15W31BBD01.

LOCATION.--Lat 44°17'37", long 92°40'05", in SE¼NW¼NW¼ sec.31, T.110 N., R.15 W., Hydrologic Unit 07040004, at Zumbrota Fire Station.

Owner: City of Zumbrota, well 3.

AQUIFER.--Prairie du Chien Group of Early Ordovician Age.

WELL CHARACTERISTICS.--Drilled unused artesian well, diameter 12 in. (0.30 m), depth 210 ft (64.0 m), cased to 50 ft (15.2 m).

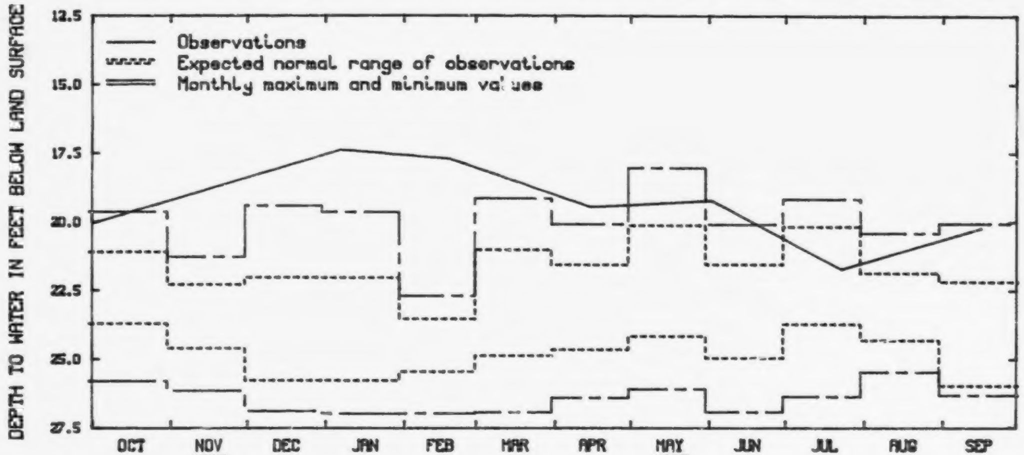
DATUM.--Altitude of land-surface datum is 1,000 ft (305 m). Measuring point: Hole in pump base, 2.20 ft (0.67 m) above land-surface datum.

PERIOD OF RECORD.--June 1973 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level, 17.38 ft (5.29 m) below land-surface datum, Jan 7, 1987; lowest, 27.00 ft (8.23 m) below land-surface datum, Jan. 5, 1978.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Jan. 7	17.38	Feb. 19	17.74	Apr. 15	19.47	June 2	19.21	July 23	21.74	Sep. 16	20.21



Ground-water levels, 1987 water year
Well 110N15W31BBD01

442401092372501. Local number, 111N15W21CDA01.

LOCATION.--Lat 44°24'01", long 92°37'25", in NE¼SE¼SW¼ sec.21, T.111 N., R.15 W., Hydrologic Unit 07040004, in Goodhue clerk's office.

Owner: City of Goodhue, creamery well.

AQUIFER.--Prairie du Chien Group of Early Ordovician Age and Jordan Sandstone of Late Cambrian age.

WELL CHARACTERISTICS.--Drilled public-supply artesian well, diameter 12 in. (0.30 m), depth 310 ft (94.5 m), cased to 175 ft (53.3 m).

DATUM.--Altitude of land-surface datum is 1,125 ft (343 m). Measuring point: Top of 1¼ in (0.03 m) elbow, 1.50 ft (0.46 m) above land-surface datum.

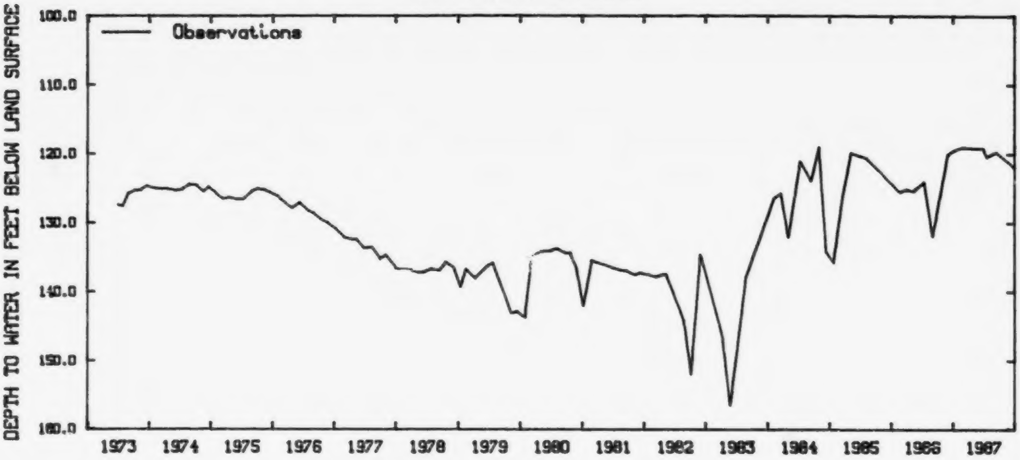
PERIOD OF RECCORD.--June 1973 to current year.

EXTREMES FOR PERIOD OF RECORD --Highest water level, 119.00 ft (36.27 m) below land-surface datum, Feb. 26, 1987; lowest, 156.5 ft (47.70 m) below land-surface datum, May 26, 1983.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Dec. 3	120.03	Jan. 7	119.45	Feb. 26	119.00	July 1	119.30	July 23	120.47	Sep. 16	119.69

GOODHUE COUNTY--Continued

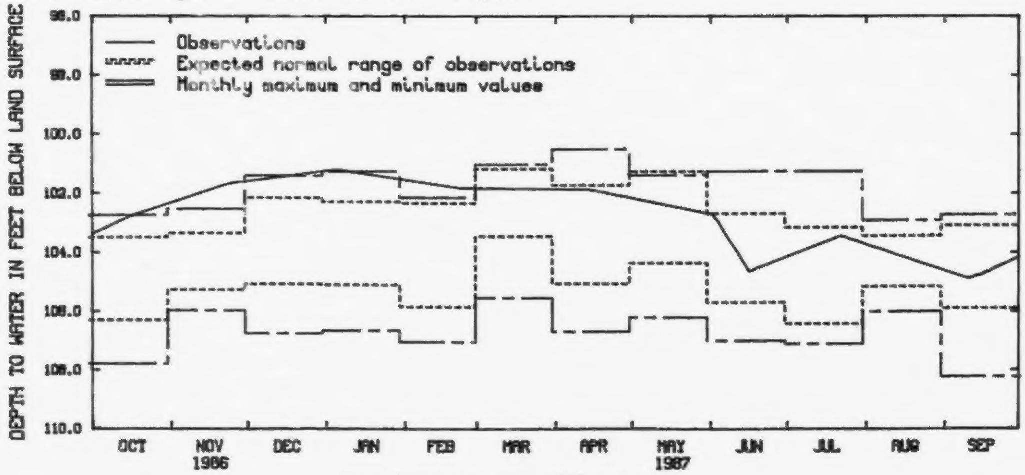


Ground-water levels, 1973-87
Well 111N15W21CDA01

443012092362201. Local number, 113N15W27BAB01.
LOCATION.--Lat 44°30'12", long 92°26'22", in NW¼NE¼NW¼ sec.27, T.113 N., R.15 W., Hydrologic Unit 07040002, at Red Wing.
Owner: City of Red Wing, Anderson Park.
AQUIFER.--Eau Claire-Mount Simon Sandstones of Late Cambrian Age.
WELL CHARACTERISTISC.--Drilled unused artesian well, diameter 12 in. (0.30 m), depth 560 ft (171 m), cased to 243 ft (74.1 m).
DATUM,--Altitude of land-surface datum is 800 ft (244 m). Measuring point: Edge of casing, 2.70 ft (0.82 m) above land-surface datum.
PERIOD OF RECORD.--April 1976, June 1978 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 100.50 ft (30.63 m) below land-surface datum, Apr. 20, 1983; lowest, 108.23 ft (32.98 m) below land-surface datum, Sept. 14, 1978.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Nov. 24	101.65	Feb. 23	101.83	June 2	102.72	July 22	103.43	Sep. 10	104.90	Sep. 16	104.74
Jan. 5	101.18	Apr. 14	101.87	June 16	104.64						



Ground-water levels, 1987 water year
Well 113N15W27BAB01

HENNEPIN COUNTY

444815093194901. Local number, 027N24W30AAA01.
LOCATION.--Lat 44°48'15", long 93°19'49", in NE¼NE¼NE¼ sec.30, T.27 N., R.24 W., Hydrologic Unit 07020012, at 4001 West 110th Street, Bloomington.
Owner: Transfiguration Church.
AQUIFER.--Buried Sand of Pleistocene Age.
WELL CHARACTERISTICS.--Drilled domestic artesian well, diameter 4 in. (0.10 m), depth 139 ft (42.4 m), screened 135 to 139 ft (41.2 to 42.4 m).
DATUM.--Altitude of land-surface datum is 832 ft (254 m). Measuring point: Top of casing, 0.50 ft (0.15 m) above land-surface datum.
PERIOD OF RECORD.--March 1979 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 63.97 ft (19.50 m) below land-surface datum, Mar. 2, 1979; lowest, 70.03 ft (21.34 m) below land-surface datum, July 24, 1987.

WATER LEVEL, IN FEET BELOW LAND SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

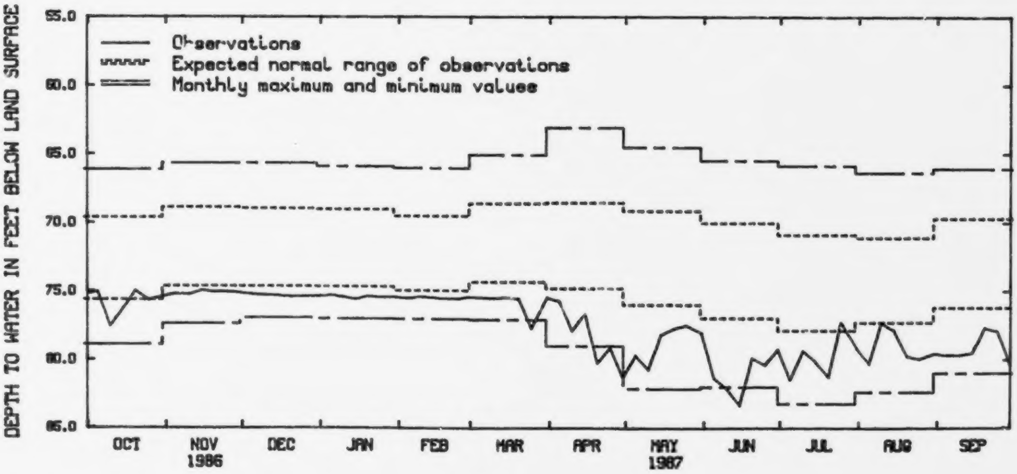
DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Dec. 2	68.69	Feb. 2	68.60	Apr. 1	68.59	May 27	69.34	July 24	70.03	Sep. 17	69.23

444801093202801. Local number, 027N24W30BDA01.
LOCATION.--Lat 44°48'01", long 93°20'28", in NE¼SE¼NW¼ sec.30, T.27 N., R.24 W., Hydrologic Unit 07020012, in Bloomington.
Owner: City of Bloomington, at Southwood Terrace.
AQUIFER.--Jordan Sandstone of Late Cambrian Age.
WELL CHARACTERISTICS.--Drilled unused artesian well, diameter 12 in. (0.30 m), depth 330 ft (101 m), cased to 269 ft (82.0 m).
DATUM.--Altitude of land-surface datum is 815 ft (248 m). Measuring point: Top of recorder platform, 2.20 ft (0.67 m) above land-surface datum.
REMARKS.--Water level affected by pumping.
PERIOD OF RECORD.--March 1969 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 63.05 ft (19.22 m) below land-surface datum, Apr. 15, 1969; lowest, 83.47 ft (25.44 m) below land-surface datum, June 16, 1987.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP
5	75.04	75.20	75.26	75.28	75.55	75.51	75.76	79.69	81.38	81.48	80.31	79.73
10	77.60	75.30	75.32	75.45	75.38	75.54	77.92	80.76	82.17	79.33	77.29	79.69
15	76.32	74.94	75.34	75.62	75.52	75.43	76.61	78.18	83.37	80.19	77.90	79.49
20	74.99	75.10	75.44	75.35	75.59	75.59	80.27	77.71	79.87	81.29	79.77	77.67
25	75.72	75.06	75.37	75.48	75.58	77.71	79.11	77.46	80.42	77.23	79.99	77.98
EOM	75.37	75.17	75.35	75.45	75.40	75.44	81.32	78.10	79.23	79.14	79.54	80.34

WTR YEAR 1987 HIGHEST 74.74 OCT. 7, 1986 LOWEST 83.47 JUN 16, 1987



Ground-water levels, 1987 water year
Well 027N24W30BDA01

HENNEPIN COUNTY--Continued

445356093145301. Local number, 028N24W23ADD01.
LOCATION.--Lat 44°53'56", long 93°14'53", in SE¼SE¼NE¼ sec.23, T.28 N., R.24 W., Hydrologic Unit 07010206, at 5728 Cedar Avenue, Minneapolis.
Owner: Hope Lutheran Church.
AQUIFER.--Prairie du Chien Group of Early Ordovician Age.
WELL CHARACTERISTICS.--Drilled irrigation artesian well, diameter 6 in. (0.15 m), depth 245 ft (74.7 m), cased to 172 ft (52.4 m).
DATUM.--Altitude of land-surface datum is 835 ft (254 m). Measuring point: Top of casing, 0.30 ft (0.09 m) above land-surface datum.
PERIOD OF RECORD.--April 1979 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 36.89 ft (11.24 m) below land-surface datum, Mar. 8, 1984; lowest, 52.90 ft (16.12 m) below land-surface datum, July 15, 1983.

WATER LEVEL, IN FEET BELOW LAND SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

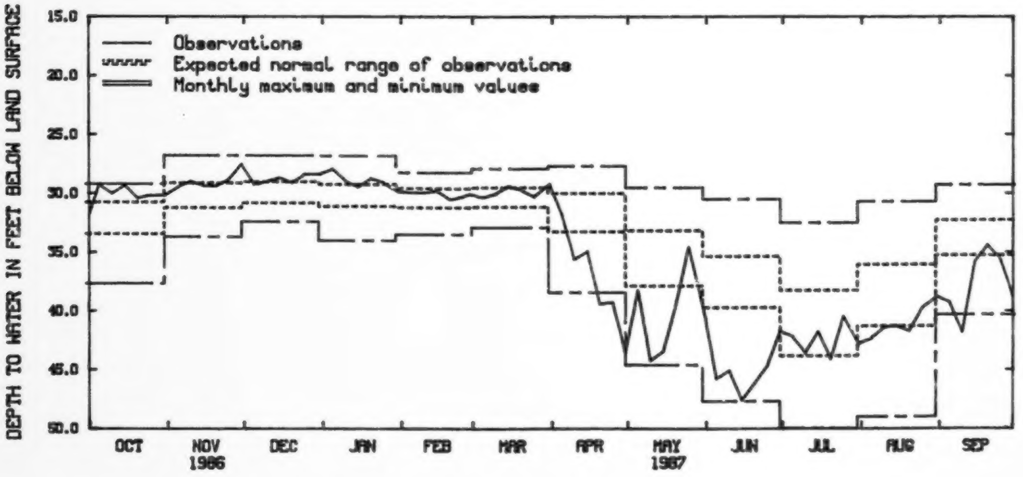
DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Dec. 3	36.55	Apr. 1	36.93	May 27	42.80	July 24	50.81	Aug. 25	45.34	Sep. 17	44.63
Feb. 5	36.53										

450116093205301. Local number, 029N24W06CCC01.
LOCATION.--Lat 45°61'16", long 93°20'53", in SW¼SW¼SW¼ sec.6, T.29 N., R.24 W., Hydrologic Unit 07010206, at 3610 Unity Avenue North, Robbinsdale.
Owner: Minnesota Department of Transportation.
AQUIFER.--St. Peter Sandstone of Middle Ordovician Age.
WELL CHARACTERISTICS.--Drilled unused artesian well, diameter 5 in. (0.13 m), depth 200 ft (61.0 m), cased to 152 ft (46.3 m).
DATUM.--Altitude of land-surface datum is 870 ft (265 m). Measuring point: Top of casing, 3.50 ft (1.07 m) above above land-surface datum.
REMARKS.--Water level affected by pumping.
PERIOD OF RECORD.--March 1973 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 24.54 ft (7.48 m) below land-surface datum, Dec. 28-29, 1975; lowest, 50.11 ft (15.27 m) below land-surface datum, July 14, 1976.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP
5	29.25	29.43	29.22	27.89		30.39	31.79	38.23	45.80	42.21	42.32	39.30
10	30.07	28.94	28.98	28.94	29.97	30.01	35.63	44.26	45.08	43.61	41.38	41.84
15	29.28	29.36	28.64	29.49	29.75	29.35	34.89	43.42	47.64	41.75	41.25	35.81
20	30.44	29.40	29.12	28.70	30.55	29.71	39.41	39.43	46.15	44.12	41.77	34.41
25	30.16	28.80	28.35	29.09	30.27	30.32	39.22	34.50	44.64	40.45	39.78	35.58
EOM	30.15	27.51	28.37	29.91	30.03	29.18	43.50	39.92	41.70	42.83	38.76	38.72

WTR YEAR 1987 HIGHEST 26.25 NOV 30, 1986 LOWEST 48.74 JUN 16, 1987



Ground-water levels, 1987 water year
Well 029N24W06CCC01

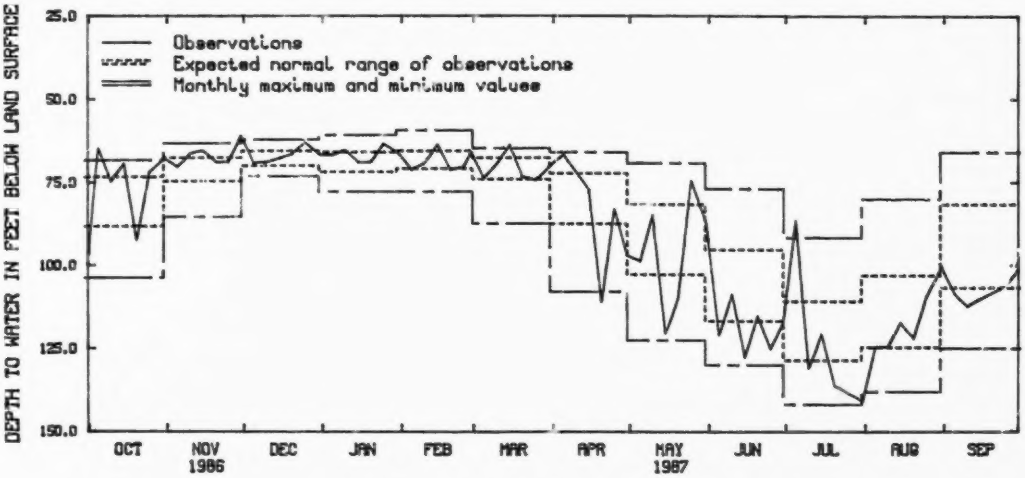
HENNEPIN COUNTY--Continued

445833093154301. Local number, 029N24W26BAB01.
LOCATION.--Lat 44°58'33", long 93°15'43", in NW¼NE¼NW¼ sec.26, T.29 N., R.24 W., Hydrologic Unit 07010206, at 425 Portland Avenue.
Owner: Minneapolis Star and Tribune.
AQUIFER.--Prairie du Chien Group of Early Ordovician Age and Jordan Sandstone of Late Cambrian Age.
WELL CHARACTERISTICS.--Drilled unused artesian well, diameter 16 in. (0.41 m), depth 445 ft (136 m), cased to 252 ft (76.8 m).
DATUM.--Altitude of land-surface datum is 835 ft (254 m). Measuring point: Top of steel cover, 7.60 ft (7.90 m) below land-surface datum.
REMARKS.--Water level affected by pumping.
PERIOD OF RECORD.--June 1981 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 56.45 ft (17.21 m) below land-surface datum, Jan. 10, 1983; lowest, 145.2 ft (44.26 m) below land-surface datum, July 22, 1982.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP
5	64.84	70.53	69.27	66.98	71.38	73.96	66.62	98.95	121.20	86.43	124.61	108.57
10	74.80	66.31	68.91	65.32	69.22	69.52		84.88	108.78	131.23	124.52	112.46
15	69.29	65.45	67.71	69.05	63.82	63.88	77.41	120.69	127.77	120.73	117.24	
20	92.57	68.87	66.51	68.95	71.33	73.37	111.12	110.04	115.27	136.30	122.15	
25	71.87	68.81	62.97	63.49	70.50	74.54	83.11	74.40	125.21		109.66	106.13
EOM	67.73	61.04	66.85	66.58	66.01	69.81	97.09	87.52	117.34	141.01	100.59	101.52

WTR YEAR 1987 HIGHEST 58.71 NOV 30, 1986 LOWEST 141.72 JUL 22, 1987



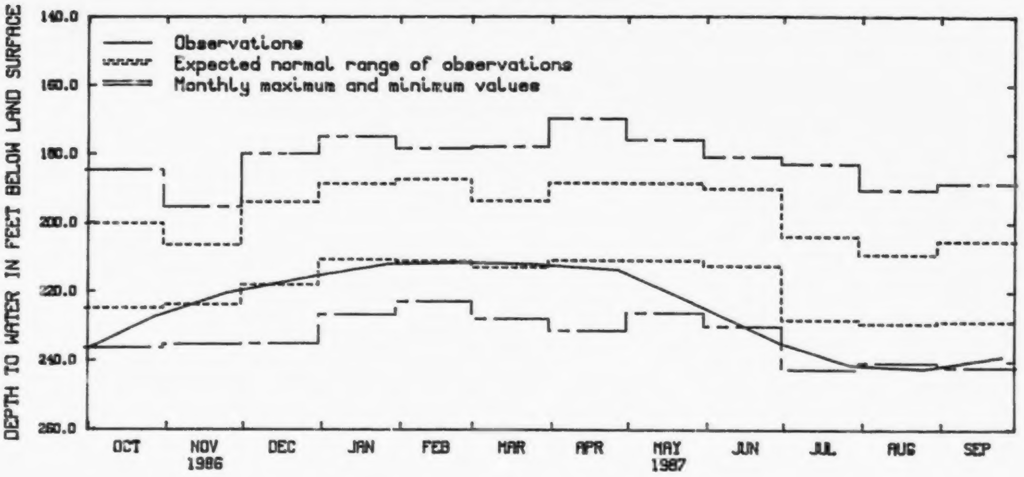
Ground-water levels, 1987 water year
Well 029N24W26BAB01

445829093162901. Local number, 029N24W27ABD01.
LOCATION.--Lat 44°58'29", long 93°16'29", in SE¼NW¼NE¼ sec.27, T.29 N., R.24 W., Hydrologic Unit 07010206, at 911 LaSalle Avenue, Minneapolis.
Owner: American Linen Supply Co.
AQUIFER.--Mount Simon Sandstone of Late Cambrian Age and Hinckley Sandstone of Late Precambrian Age.
WELL CHARACTERISTICS.--Drilled unused artesian well, diameter 16 in. (0.41 m), depth 1,094 ft (333 m), cased to 812 ft (248 m).
DATUM.--Altitude of land-surface datum is 850 ft (259 m). Measuring point: Hole in pump base, 22.00 ft (6.71 m) below land-surface datum.
REMARKS.--Water level affected by regional pumping.
PERIOD OF RECORD.--July 1970 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 169.8 ft (51.76 m) below land-surface datum, Apr. 15, 1980; lowest, 242.38 ft (73.87 m) below land-surface datum, Aug. 25, 1987.

WATER LEVEL, IN FEET BELOW LAND SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct. 27	227.46	Dec. 29	215.50	Feb. 24	211.52	Apr. 27	213.84	June 29	234.86	Aug. 25	242.38
Nov. 24	220.53	Jan. 27	211.90	Mar. 26	212.29	May 26	223.30	July 27	241.35	Sep. 25	238.58

HENNEPIN COUNTY--Continued



Ground-water levels, 1987 water year
Well 029N24W27ABD01

445158093225101. Local number, 116N21W07DAD01.
LOCATION.--Lat 44°51'58", long 93°22'51", in SE¼NE¼SE¼ sec.7, T.116 N., R.21 W., Hydrologic Unit 07020012, at Braemer Golf Course.
Owner: City of Edina, well 14.
AQUIFER.--Jordan Sandstone of Late Cambrian Age.
WELL CHARACTERISTICS.--Drilled public-supply artesian well, diameter 16 in. (0.41 m), depth 420 ft (128 m), cased to 325 ft (99.1 m).
DATUM.--Altitude of land-surface datum is 848 ft (258 m). Measuring point: Vent pipe at land-surface datum.
PERIOD OF RECORD.--April 1965 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 31.26 ft (9.53 m) below land-surface datum, Apr. 4, 1966; lowest, 63.20 ft (19.26 m) below land-surface datum, July 21, 1981.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

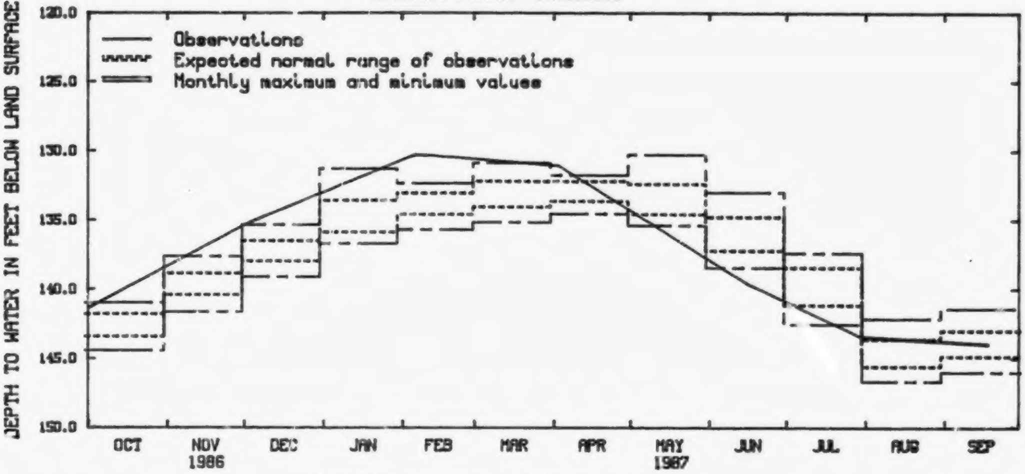
DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Dec. 5	49.15	Mar. 6	48.70	June 30	60.38	Sep. 1	59.48	Sep. 30	61.03

445618093211801. Local number, 117N21W16CDB01.
LOCATION.--Lat 44°56'18", long 93°21'18", in NW¼SE¼SW¼ sec.16, T.117 N., R.21 W., Hydrologic Unit 07010206, at 2565 Wooddale Avenue South, St. Louis Park.
Owner: D-A Lubricant Co.
AQUIFER.--Ironton-Galesville Sandstones of Late Cambrian Age.
WELL CHARACTERISTICS.--Drilled observation artesian well, diameter 4 in. (0.10 m), depth 691 ft (211 m), screened 651 to 661 ft (198 to 202 m).
DATUM.--Altitude of land-surface datum is 917.2 ft (279.6 m), National Geodetic Vertical Datum of 1929. Measuring point: Hole in well seal, 3 60 ft (1.10 m) above land-surface datum.
REMARKS.--Water level affected by pumping.
PERIOD OF RECORD.--April 1980 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 130.25 ft (39.70 m) below land-surface datum, Feb. 6, 1987; lowest, 146.67 ft (44.70 m) below land-surface datum, Aug. 31, 1982.

WATER LEVEL, IN FEET BELOW LAND SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Dec. 3	135.15	Feb. 6	130.25	Apr. 3	131.10	June 15	139.54	July 30	143.43	Sep. 18	143.98

HENNEPIN COUNTY--Continued

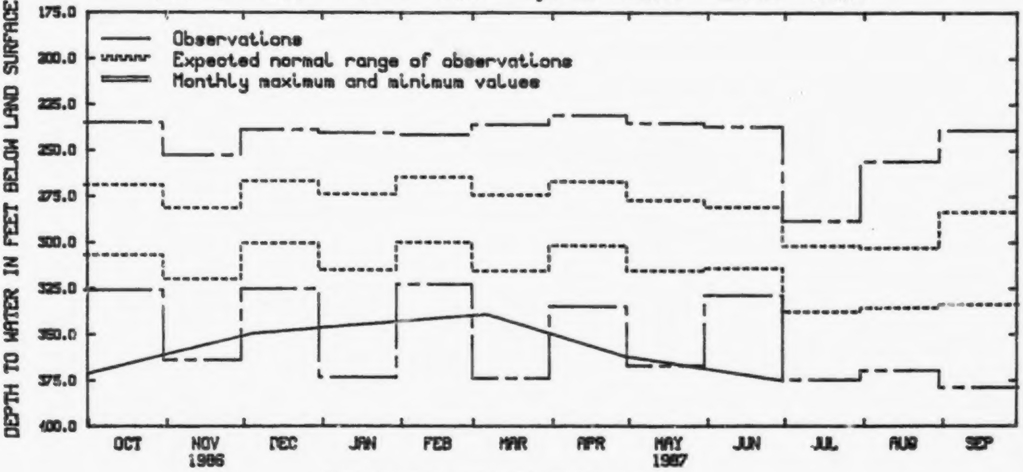


Ground-water levels, 1987 water year
Well 117N21W16CDB01

445347093213901. Local number, 117N21W32DAD01.
LOCATION.--Lat 44°53'47", long 93°21'39", in SE¼NE¼SE¼ sec.32, T.117 N., R.21 W., Hydrologic Unit 07010206, at Hanson Road and Benton Avenue.
Owner: City of Edina, well 9.
AQUIFER.--Hinckley Sandstone of Late Precambrian Age.
WELL CHARACTERISTICS.--Drilled public-supply artesian well, diameter 16 in. (0.41 m), depth 1,130 ft (344 m), cased to 1,010 ft (308 m).
DATUM.--Land-surface datum is 933.3 ft (284.5 m) National Geodetic Vertical Datum of 1929. Measuring point: Hole in east side of pump base, 2.00 ft (0.61 m) above land-surface datum.
REMARKS.--Water level affected by pumping.
PERIOD OF RECORD.--August 1961 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 230.81 ft (70.35 m) below land-surface datum, Apr. 20, 1962; lowest, 379.00 ft (115.5 m) below land-surface datum, Sept. 25, 1985.

WATER LEVEL, IN FEET BELOW LAND SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Dec. 5	349.14	Mar. 6	338.84	Apr. 29	362.00	June 30	375.47



Ground-water levels, 1987 water year
Well 117N21W32DAD01

HENNEPIN COUNTY--Continued

445646093395301. Local number, 117N24W13BBC04.

LOCATION.--Lat 44°45'46", long 93°39'53", in SW¼NW¼NW¼ sec.13, T.117 N., R.24 W., Hydrologic Unit 07010206, at 3-Point Road.

Owner: City of Mound, well 4.

AQUIFER.--Mount Simon Sandstone of Late Cambrian Age.

WELL CHARACTERISTICS.--Drilled unused artesian well, diameter 10 in. (0.25 m), depth 729 ft (222 m), cased to 600 ft (183 m).

DATUM.--Altitude of land-surface datum is 945 ft (288 m): Measuring point: Top of breather pipe, 2.35 ft (0.71 m) above land-surface datum.

PERIOD OF RECORD.--November 1985 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level, 65.30 ft (19.90 m) below land-surface datum, Mar. 4, 1980; lowest, 72.30 ft (22.03 m) below-land surface datum, Dec. 10, 1970.

WATER LEVEL, IN FEET BELOW LAND SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct. 29	67.40	Feb. 2	66.33	Apr. 1	66.21	June 8	67.55	July 20	68.87	Sep. 25	68.93

445740093333001. Local number, 117N23W11BBD01.

LOCATION.--Lat 44°57'40", long 93°33'30", in SE¼NW¼NW¼ sec.11, T.117 N., R.23 W., Hydrologic Unit 07010206, 2 mi (3.2 km) southwest of Wayzata, at Lake Minnetonka.

Owner: Minnetonka Boat Works, Inc., Oronc.

AQUIFER.--Prairie du Chien Group of Early Ordovician Ag[illegible] Jordan Sandstone of Late Cambrian Age.

WELL CHARACTERISTICS.--Drilled observation artesian we[illegible]ameter 6 in. (0.15 m), depth 437 ft (133 m), cased to 270 ft (82.3 m).

DATUM.--Altitude of land-surface datum is 930.8 ft ([illegible] m) National Geodetic Vertical Datum of 1929. Measuring point: Wood floor of instrument shelter, 3.30 [illegible] m) above land-surface datum.

REMARKS.--Water level affected by pumping.

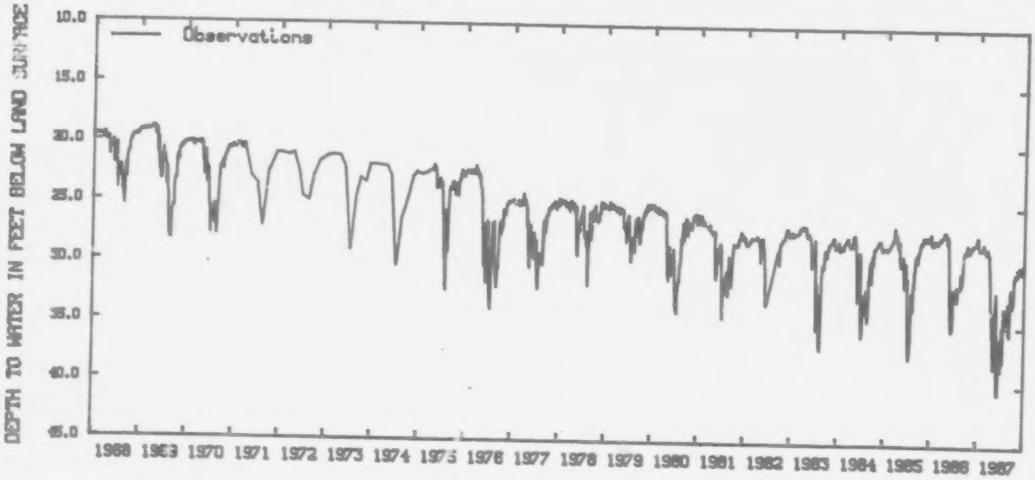
PERIOD OF RECORD.--August 1942 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level, [illegible].33 m) below land-surface datum, Apr. 30, 1954; lowest, 40.92 ft (12.47 m) below land-surface datu[illegible] 16, 1987.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP
5	28.44	28.36	27.98	27.46	28.44	28.63	29.05	35.19	36.62	38.62	35.06	35.44
10	28.34	28.35	28.05	28.12	28.31	28.79	30.37	38.43	40.53	37.32	34.73	35.62
15	28.04	28.28	28.01	28.45	28.01	28.37	31.47	37.23	40.56	34.90	33.66	33.28
20	28.23	28.09	28.00		27.94	28.36	33.82	36.29	37.42	37.81	33.67	31.95
25	28.70	28.19	27.76		28.39		33.53	32.88	36.61	34.50	34.38	31.71
EOM	28.65	28.19	27.37		28.49		35.76	32.08	35.94	33.30	32.88	33.24

WTR YEAR 1987 HIGHEST 27.31 DEC. 31, 1986 LOWEST 40.92 JUN 16, 1987



Ground-water levels, 1968-87
Well 117N23W11BBD01

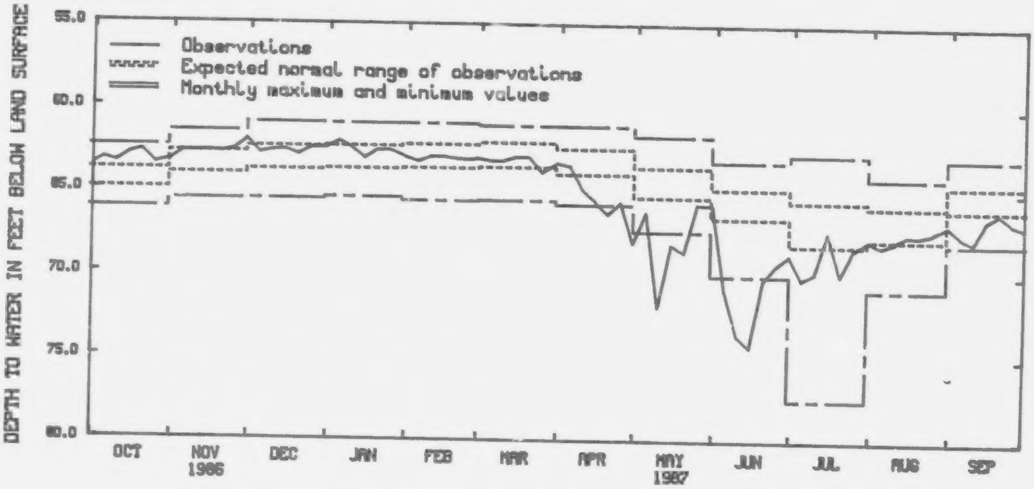
HENNEPIN COUNTY--Continued

450223093231801. Local number, 118N21W07DCB01.
LOCATION.--Lat 45°02'23", long 93°23'18", in NW¼SW¼SE¼ sec.7, T.118 N., R.21 W., Hydrologic Unit 07010206, at 47th Avenue North and Aquila Avenue.
Owner: City of New Hope.
AQUIFER.--Jordan Sandstone of Late Cambrian Age.
WELL CHARACTERISTICS.--Drilled unused artesian well, diameter 16 in. (0.41 m), depth 422 ft (129 m), cased to 339 ft (103 m).
DATUM.--Altitude of land-surface datum is 933 ft (284 m). Measuring point: Top of wood platform, 3.00 ft (0.91 m) above land-surface datum.
REMARKS.--Water level affected by pumping.
PERIOD OF RECORD.--October 1965 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 60.46 ft (18.43 m) below land-surface datum, Dec. 17, 1967; lowest, 77.56 ft (23.64 m) below land-surface datum, July 11, 1985.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP
5	63.21	62.74	62.84	62.06	63.30	63.25	63.52	66.23	70.90	70.26	68.23	67.57
10	63.47	62.77	62.65	62.52	62.96	63.20	64.89	71.99	73.64	69.82	67.91	67.96
15	62.91	62.71	62.58	63.13	62.97	62.94	65.63	68.19	74.35	67.40	67.48	66.57
20	62.70	62.80	62.95	62.60	63.12	62.97	66.41	68.68	70.30	70.01	67.58	66.09
25	63.52	62.62	62.47	62.57	63.16	63.90	65.65	65.72	69.38	68.44	67.33	66.72
EOM	63.27	62.00	62.46	63.03	63.05	63.29	68.11	65.84	68.77	67.82	66.87	67.02

WTR YEAR 1987 HIGHEST 61.83 JAN. 6, 1987 LOWEST 75.16 JUN 17, 1987



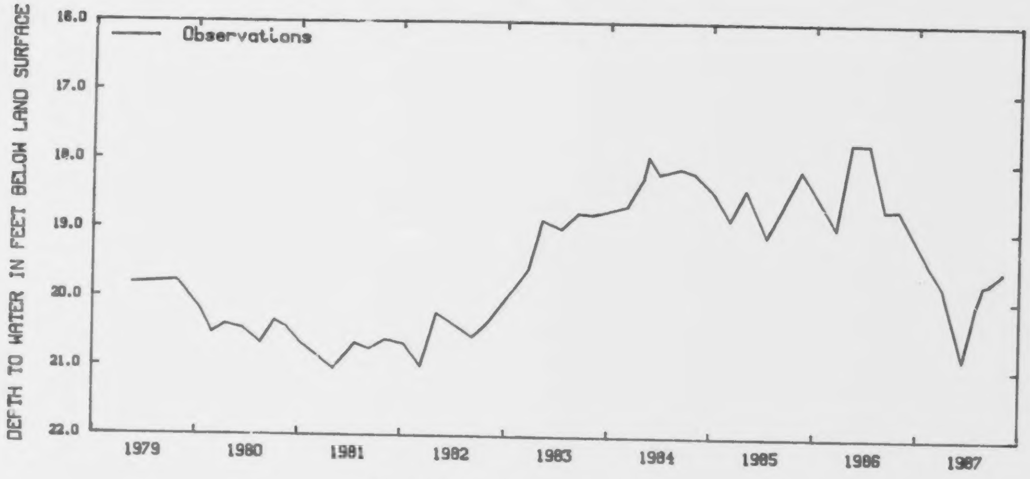
Ground-water levels, 1987 water year
Well 118N21W07DCB01

445905093224401. Local number, 118N21W32CBB01.
LOCATION.--Lat 44°59'05", long 93°22'44", in NW¼NW¼SW¼ sec.32, T.118 N., R.21 W., Hydrologic Unit 07010206, at Winnetka Avenue and Highway 55, Golden Valley.
Owner: Red Owl Store.
AQUIFER.--Surficial sand and gravel of Pleistocene Age.
WELL CHARACTERISTICS.--Drilled unused water-table well, diameter 6 in. (0.16 m), depth 95 ft (29.0 m), screened 87 to 95 ft (26.5 to 29.0 m).
DATUM.--Altitude of land-surface datum is 895 ft (273 m). Measuring point: Top of well cap, 0.80 ft (0.24 m) above land-surface datum.
PERIOD OF RECORD.--May 1979 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 17.94 ft (5.47 m) below land-surface datum, May 21, 1984; lowest, 21.05 ft (5.42 m) below land-surface datum, May 5, 1981.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct. 29	18.67	Apr. 3	19.80	June 15	20.85	July 30	20.07	Aug. 27	19.75	Sep. 18	19.72
Feb. 6	19.43										

HENNEPIN COUNTY--Continued

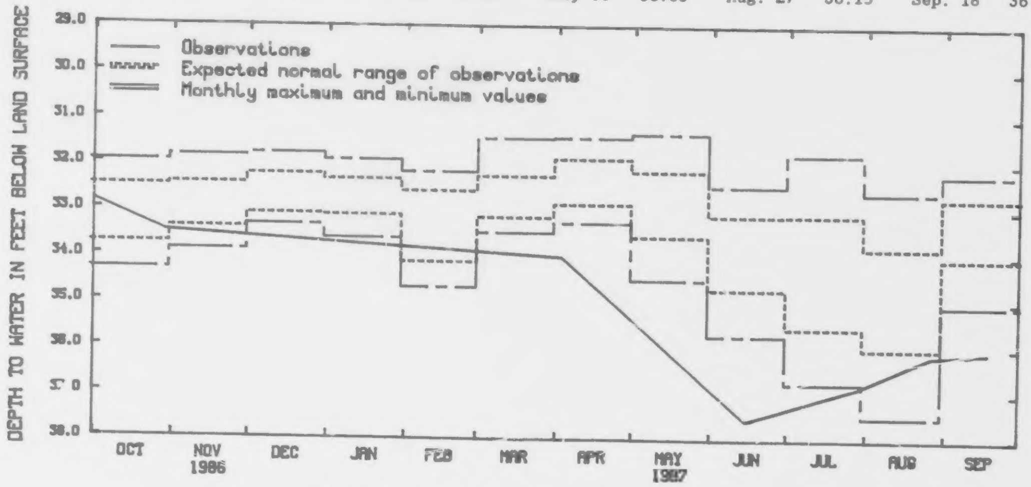


Ground-water levels, 1979-87
Well 118N21W32CBB01

445857093223101. Local number, 118N21W32CBD01.
LOCATION.--Lat 44°58'57", long 93°22'31", in SE¼NW¼SW¼ sec.32, T.118 N., R.21 W., Hydrologic Unit 07010206, at 760 Harold Avenue, Golden Valley.
Owner: Golden Valley Methodist Church.
AQUIFER.--St. Peter Sandstone of Middle Ordovician Age.
WELL CHARACTERISTICS.--Drilled unused artesian well, diameter 6 in. (0.15 m), depth 265 ft (80.8 m), cased to 200 ft (61.0 m).
DATUM.--Altitude of land-surface datum is 890 ft (271 m). Measuring point: Top of well cap, 0.70 ft (0.21 m) above land-surface datum.
PERIOD OF RECORD.--February 1971 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 31.40 ft (9.57 m) below land-surface datum, May 3, 1984; lowest, 37.51 ft (11.43 m) below land-surface datum, Aug. 24, 1971.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct. 29	33.50	Apr. 3	34.03	June 15	37.60	July 30	36.83	Aug. 27	36.15	Sep. 18	36.07



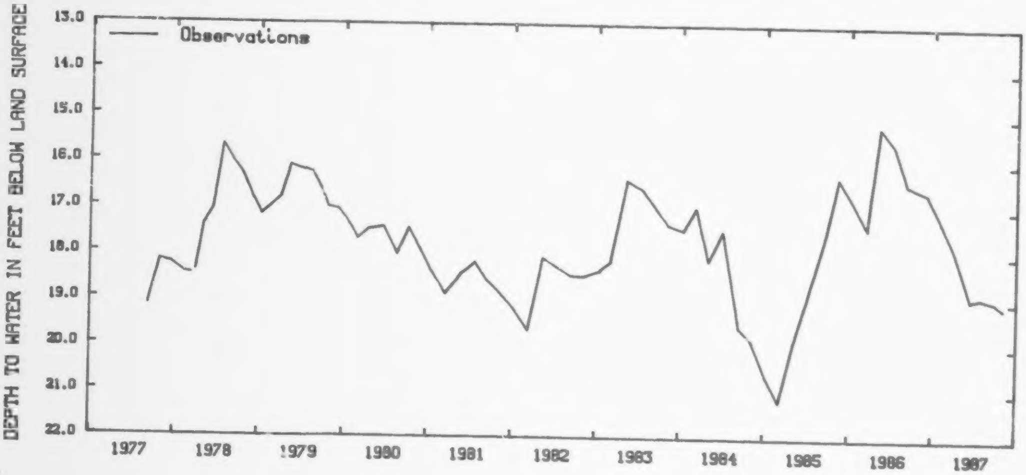
Ground-water levels, 1987 water year
Well 118N21W32CBD01

HENNEPIN COUNTY--Continued

450854093212801. Local number, 119N21W04BBA01.
LOCATION.--Lat 45°08'54", long 93°21'28", in NE¼NW¼NW¼ sec.4, T.119 N., R.21 W., Hydrologic Unit 07010206, 109th Avenue North, 0.15 mi (0.24 km) east of Zane Avenue North, Brooklyn Park.
Owner: Walter Tessman.
AQUIFER.--Surficial sand and gravel of Pleistocene Age.
WELL CHARACTERISTICS.--Drilled irrigation water-table well, diameter 12 in. (0.30 m), depth 80 ft (24.4 m), screened 62 to 80 ft (18.9 to 24.4 m).
DATUM.--Altitude of land-surface datum is 876 ft (267 m). Measuring point: Hole in pump base, 1.00 ft (0.30 m) above land-surface datum.
PERIOD OF RECORD.--September 1977 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 15.66 ft (4.77 m) below land-surface datum, July 26, 1978; lowest, 21.18 ft (6.45 m) below land-surface datum, Mar. 8, 1985.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Dec. 5	16.63	Feb. 6	17.25	Apr. 3	17.85	June 15	18.93	July 29	18.86	Sep. 30	18.97



Ground-water levels, 1977-87
Well 119N21W04BBA01

450519093281401. Local number, 119N22W28ACC01.
LOCATION.--Lat 45°05'19", long 93°28'14", in SW¼SW¼NE¼ sec.28, T.119 N., R.22 W., Hydrologic Unit 07010206, at 7349 Mariner Drive, Maple Grove.
Owner: Cliff Lake.
AQUIFER.--Jordan Sandstone of Late Cambrian Age.
WELL CHARACTERISTICS.--Drilled unused artesian well, diameter 4 in. (0.10 m), depth 192 ft (58.5 m), cased to 187 ft (57.0 m).
DATUM.--Altitude of land-surface datum is 925 ft (288 m). Measuring point: Top of well cap, 1.80 ft (0.55 m) above land-surface datum.
PERIOD OF RECORD.--October 1980 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 26.92 ft (8.21 m) below land-surface datum, Sept. 12, 1984; lowest, 29.94 ft (9.13 m) below land-surface datum, Mar. 11, 1982.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Dec. 5	26.98	Feb. 6	27.10	Apr. 3	27.20	June 15	27.94	July 29	27.78	Sep. 18	27.69

HOUSTON COUNTY

433953091251801. Local number, 102N05W03DCC01.
LOCATION.--Lat 43°39'53", long 91°25'18", in SW¼SW¼SE¼ sec.3, T.102 N., R.5 W., Hydrologic Unit 07060001, 3 mi (4.8 km) east of Caledonia.
Owner: U.S Geological Survey.
AQUIFER.--Jordan Sandstone of Late Cambrian Age.
WELL CHARACTERISTICS.--Drilled observation water-table well, diameter 4 in. (0.10 m), depth 360 ft (110 m), cased to 309 ft (94.2 m).
DATUM.--Altitude of land-surface datum is 1,210 ft (369 m). Measuring point: Top of casing, 2.50 ft (0.76 m) above land-surface datum.
PERIOD OF RECORD.--June 1981 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 213.76 ft (65.15 m) below land-surface datum, July 17, 1985; lowest, 245.50 ft (74.82 m) below land-surface datum, June 4, 1981.

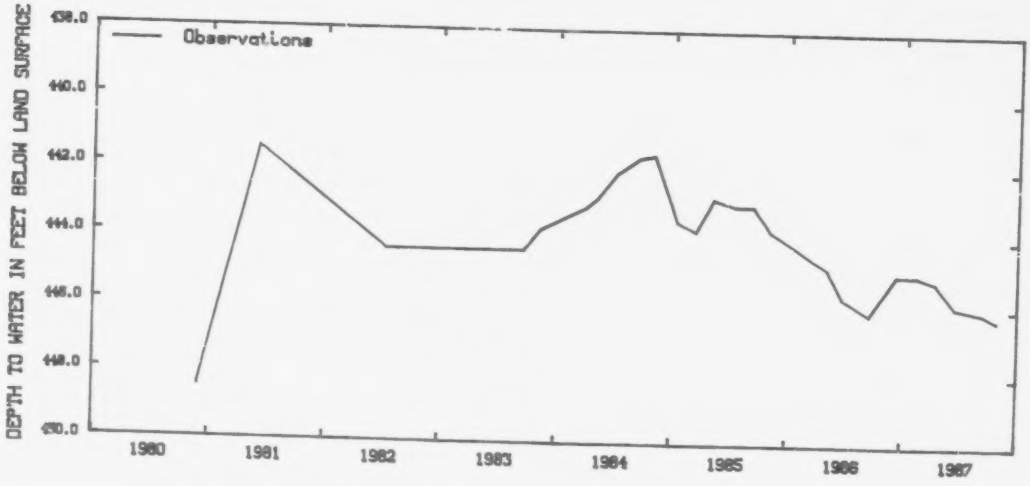
WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Dec. 11	222.26	Feb. 17	222.90	Apr. 16	222.95	June 16	223.45	Sep. 16	223.63

433935091252001. Local number, 102N05W03DCC02.
LOCATION.--Lat 43°39'35", long 91°25'20", in SW¼SW¼SE¼ sec.3, T.102 N., R.5 W., Hydrologic Unit 07060001, 3 mi (4.8 km) east of Caledonia.
Owner: U.S. Geological Survey.
AQUIFER.--Ironton-Galesville Sandstones of Late Cambrian Age.
WELL CHARACTERISTICS.--Drilled observation artesian well, diameter 4 in. (0.10 m), depth 650 ft (198 m), cased to 614 ft (187 m).
DATUM.--Altitude of land-surface datum is 1,210 ft (369 m). Measuring point: Top of casing, 2.50 ft (0.76 m) above land-surface datum.
PERIOD OF RECORD.--November 1980 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 441.50 ft (134.56 m) below land-surface datum, June 4, 1981; lowest, 448.50 ft (136.70 m) below land-surface datum, Nov. 25, 1980.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Dec. 11	445.00	Feb. 17	445.03	Apr. 16	445.22	June 16	445.92	Sep. 16	446.10



Ground-water levels, 1980-87
Well 102N05W03DCC02

HOUSTON COUNTY--Continued

443935091252901. Local number, 102N05W03DCC03.
LOCATION.--Lat 44°39'35", long 91°25'19", in SW¼SW¼SE¼ sec.3, T.102 N., R.5 W., Hydrologic Unit 07060001, 3 mi (4.8 km) east of Caledonia.
Owner: U.S. Geological Survey
AQUIFER.--Mount Simon Sandstone of Late Cambrian Age.
WELL CHARACTERISTICS.--Drilled observation artesian well, diameter 4 in. (0.10 m), depth 888 ft (271 m), cased to 858 ft (262 m).
DATUM.--Altitude of land-surface datum is 1,210 ft (369 m). Measuring point: Top of casing, 2.00 ft (0.61 m) above land-surface datum.
PERIOD OF RECORD.--July 1982 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 522.00 ft (159.10 m) below land-surface datum, Nov. 10, 1983; lowest, 524.59 ft (159.89 m) below land-surface datum, Sept. 20, 1983.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

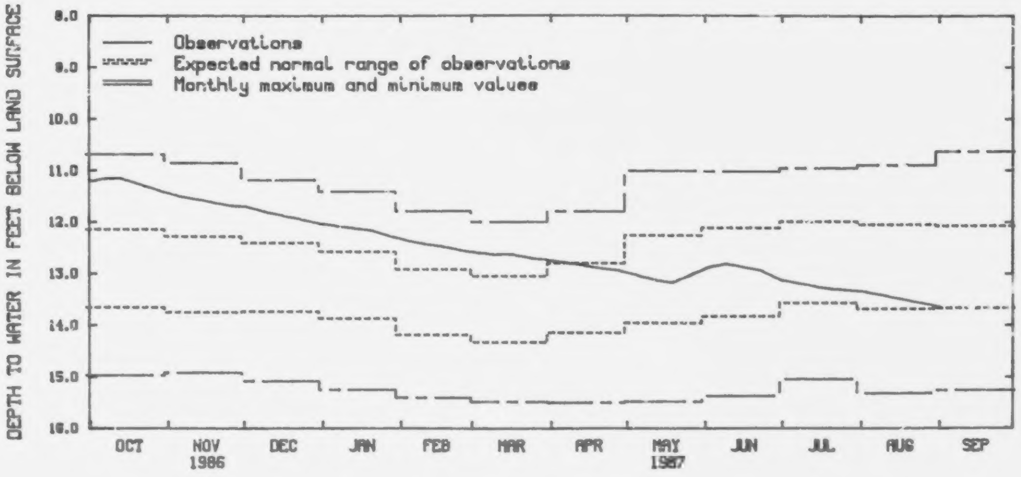
DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Dec. 11	523.60	Feb. 17	524.10	Apr. 16	523.85	June 16	524.25	Sep. 16	524.26

HUBBARD COUNTY

465142094433201. Local number, 139N32W16AAA01.
LOCATION.--Lat 46°51'42", long 94°43'32", in NE¼NE¼NE¼ sec.16, T.139 N., R.32 W., Hydrologic Unit 07010106, at Badoura Nursery.
Owner: U.S. Geological Survey.
AQUIFER.--Surficial outwash sand of Pleistocene Age.
WELL CHARACTERISTICS.--Bored observation water-table well, diameter 1¼ in. (0.03 m), depth 21 ft (6.4 m), screened 19 to 21 ft (5.8 to 6.4 m).
DATUM.--Altitude of land-surface datum is 1,419 ft (433 m). Measuring point: Top of casing, 2.00 ft (0.61 m) above land-surface datum.
REMARKS.--Measured weekly by Archie Hakala.
PERIOD OF RECORD.--September 1970 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 10.63 ft (3.24 m) below land-surface datum, Sept. 24, 1985; lowest, 15.51 ft (4.73 m) below land-surface datum, Apr. 12, 1977.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct. 7	11.15	Dec. 2	11.71	Jan. 21	12.18	Mar. 9	12.64	Apr. 28	12.95	June 23	12.95
13	11.14	9	11.80	27	12.27	17	12.64	May 5	13.04	30	13.12
21	11.28	16	11.88	Feb. 3	12.36	24	12.71	12	13.13	July 14	13.25
28	11.39	23	11.95	10	12.43	30	12.74	19	13.18	20	13.30
Nov. 4	11.49	30	12.03	17	12.48	Apr. 7	12.80	26	13.02	Aug. 3	13.36
18	11.62	Jan. 6	12.08	24	12.55	14	12.85	June 2	12.87	11	13.44
25	11.69	13	12.13	Mar. 3	12.61	21	12.91	9	12.80		



Ground-water levels, 1987 water year
Well 139N32W16AAA01

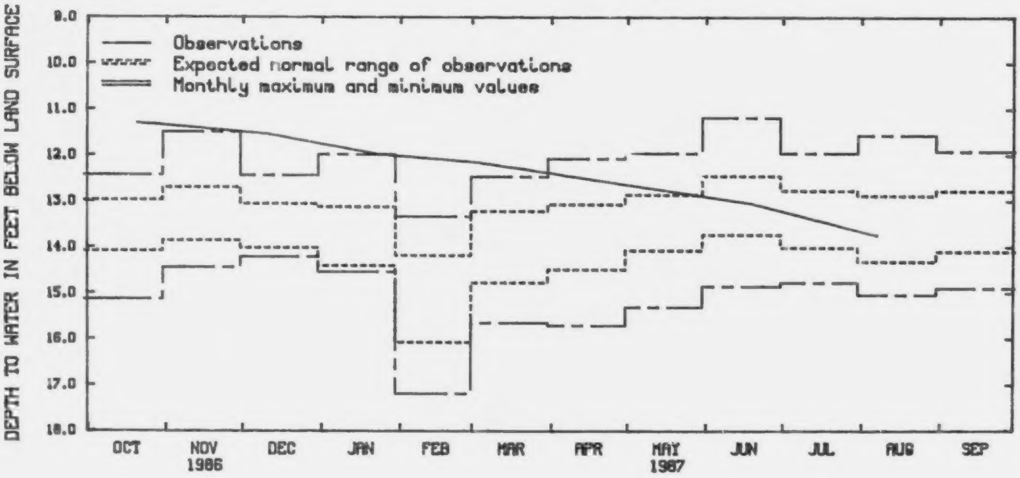
GROUND-WATER LEVELS

ISANTI COUNTY

453125093181101. Local number, 035N24W14BCD01.
LOCATION.--Lat 45°31'25", long 93°18'11", in SE¼SW¼NW¼ sec.14, T.35 N., R.24 W., Hydrologic Unit 07010207, northwest of Isanti.
Owner: Allen Kluck.
AQUIFER.--Eau Claire - Mount Simon Formations of Late Cambrian Age.
WELL CHARACTERISTICS.--Drilled irrigation artesian well, diameter 12 in. (0.30 m), depth 300 ft (91.4 m), cased to 105 ft (32.0 m).
DATUM.--Altitude of land-surface datum is 940 ft (287 m). Measuring point: Hole in pump base, 0.10 ft (0.03 m) above land-surface datum.
PERIOD OF RECORD.--February 1968 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 11.18 ft (3.40 m) below land-surface datum, June 24, 1986; lowest, 15.72 ft (4.79 m) below land-surface datum, Apr. 4, 1968.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct. 20	11.31	Dec. 11	11.56	Jan. 22	11.99	Mar. 4	12.18	June 19	13.07	Aug. 7	13.76

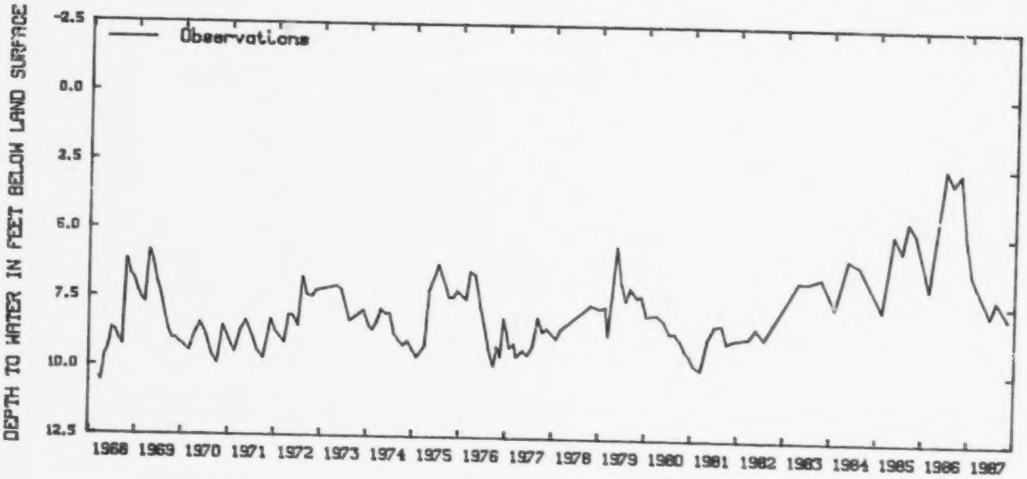


Ground-water levels, 1987 water year
Well 035N24W14BCD01

453058093175901. Local number, 035N24W14CDC01.
LOCATION.--Lat 45°30'58", long 93°17'59", in SW¼SE¼SW¼ sec.14, T.35 N., R.24 W., Hydrologic Unit 07010207, northwest of Isanti.
Owner: Ernest Kluck.
AQUIFER.--Surficial outwash sand of Pleistocene Age.
WELL CHARACTERISTICS.--Driven unused water-table well, diameter 1¼ in. (0.03 m), depth 17 ft (5.18 m), screen information not available.
DATUM.--Altitude of land-surface datum is 930 ft (283 m). Measuring point: Top of casing, 3.00 ft (0.91 m) above land-surface datum.
PERIOD OF RECORD.--March 1968 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 2.50 ft (0.76 m) below land-surface datum, June 24, 1986; lowest, 10.60 ft (3.23 m) below land-surface datum, Apr. 4, 1968.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct. 20	2.64	Dec. 11	5.07	Jan. 22	6.32	Mar. 4	6.77	June 19	7.81	Aug. 7	7.24



Ground-water levels, 1968-87
Well 035N24W14CDC01

453410093140001. Local number, 036N23W32ACB01.

LOCATION.--Lat 45°34'10", long 93°14'00", in NW¼SW¼NE¼ sec.32, T.36 N., R.23 W., Hydrologic Unit 07010207, in Cambridge.
Owner: City of Cambridge, well 4.

AQUIFER.--Hinckley Sandstone of Late Precambrian Age.

WELL CHARACTERISTICS.--Drilled public-supply artesian well, diameter 20 in. (0.51 m), depth 630 ft (192 m), cased to 352 ft (107 m).

DATUM.--Altitude of land-surface datum is 960 ft (293 m). Measuring point: Edge of vent pipe, 3.00 ft (0.91 m) above land-surface datum.

REMARKS.--Measured weekly by Thomas Minar. Water level affected by pumping.

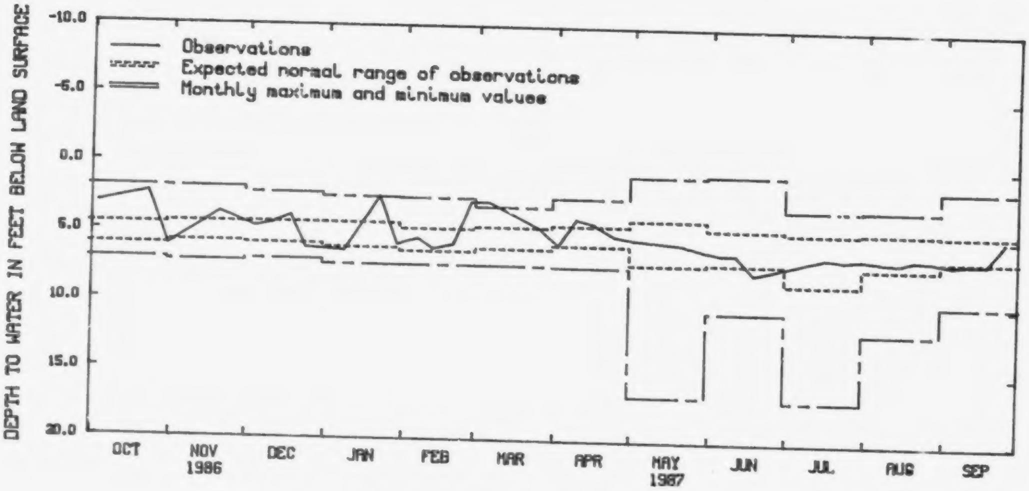
PERIOD OF RECORD.--July 1972 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level, 0.60 ft (0.18 m) below land-surface datum, June 21, 1984; lowest, 16.95 ft (5.17 m) below land-surface datum, July 11, 1974.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct. 3	3.10	Dec. 18	3.85	Feb. 12	6.20	Apr. 9	3.87	June 5	6.35	Aug. 6	6.64
23	2.25	24	5.22	20	5.80	16	4.25	11	6.32	14	6.76
31	6.08	Jan. 8	6.42	27	2.75	24	5.12	18	7.71	20	6.40
Nov. 20	3.65	22	2.42	Mar. 6	2.80	May 1	5.35	July 16	6.39	28	6.55
Dec. 4	4.73	29	5.88	26	4.66	21	5.70	23	6.60	Sep. 4	6.77
11	4.39	Feb. 6	5.40	Apr. 2	5.85	28	6.05	30	6.44	10	6.59
										18	6.65
										25	4.99

ISANTI COUNTY--Continued



Ground-water levels, 1987 water year
Well 036N23W32ACB01

ITASCA COUNTY

471450093322001. Local number, 055N25W17ACD01.
LOCATION.--Lat 47°14'50", long 93°32'20", in SE¼SW¼NE¼ sec.17, T.55 N., R.25 W., Hydrologic Unit 07010103, at west end of 13th Street NW, Grand Rapids.
Owner: U.S. Geological Survey.
AQUIFER.--Buried sand and gravel of Pleistocene Age.
WELL CHARACTERISTICS.--Drilled observation water-table well, diameter 4 in. (0.10 m), depth 147 ft (44.8 m), screened 143 to 147 ft (43.6 to 44.8 m).
DATUM.--Altitude of land-surface datum is 1,318 ft (402 m). Measuring point: Top of platform, 1.60 ft (0.49 m) above land-surface datum.
PERIOD OF RECORD.--April 1962 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 29.04 ft (8.85 m) below land-surface datum, June 1, 1966; lowest, 33.92 ft (10.34 m) below land-surface datum, May 17, 1977.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

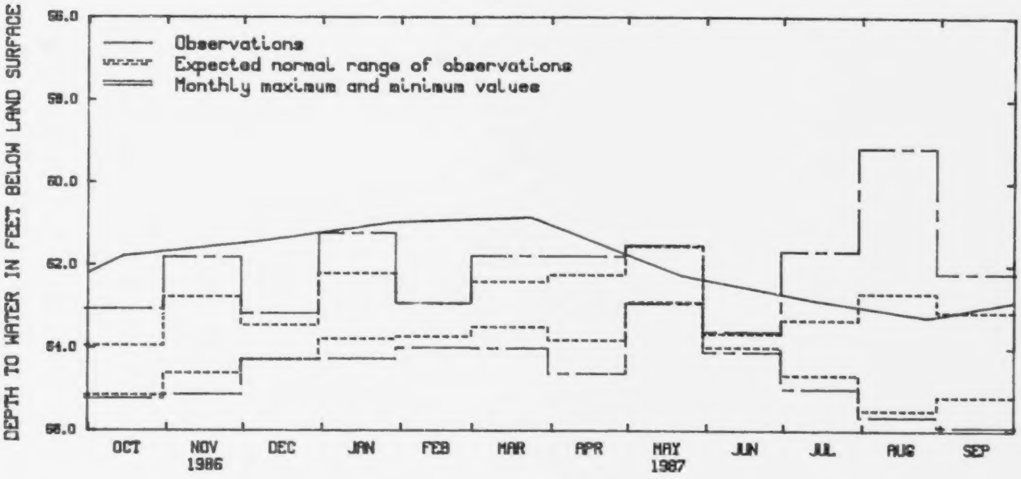
DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct. 17	30.84	Jan. 9	31.23	Apr. 2	31.53	June 22	31.75	Aug. 21	31.66	Sep. 25	31.53
Nov. 24	31.05	Feb. 17	31.43								

JACKSON COUNTY

434742095191501. Local number, 104N37W19DBD01.
LOCATION.--Lat 43°47'42", long 95°19'15", in SE¼NW¼SE¼ sec.19, T.104 N., R.37 W., Hydrologic Unit 07100001, at Heron Lake.
Owner: City of Heron Lake, old railroad well.
AQUIFER.--Sioux Quartzite of Late Precambrian Age.
WELL CHARACTERISTICS.--Drilled public-supply artesian well, diameter 16 in. (0.41 m), depth 323 ft (98.4 m), screened 205 to 225 ft (62.5 to 68.6 m).
DATUM.--Altitude of land-surface datum is 1,420 ft (433 m). Measuring point: Edge of breather pipe, 2.60 ft (0.79 m) above land-surface datum.
PERIOD OF RECORD.--August 1972, July 1973, September 1976, July 1978 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 59.16 ft (18.03 m) below land-surface datum, Aug. 11, 1972; lowest, 66.10 ft (20.15 m) below land-surface datum, July 14, 1981.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct. 15	61.78	Jan. 29	60.97	Mar. 24	60.85	May 22	62.27	July 13	62.86	Aug. 27	63.27
Dec. 11	61.40										



Ground-water levels, 1987 water year
Well 104N37W19DBD01

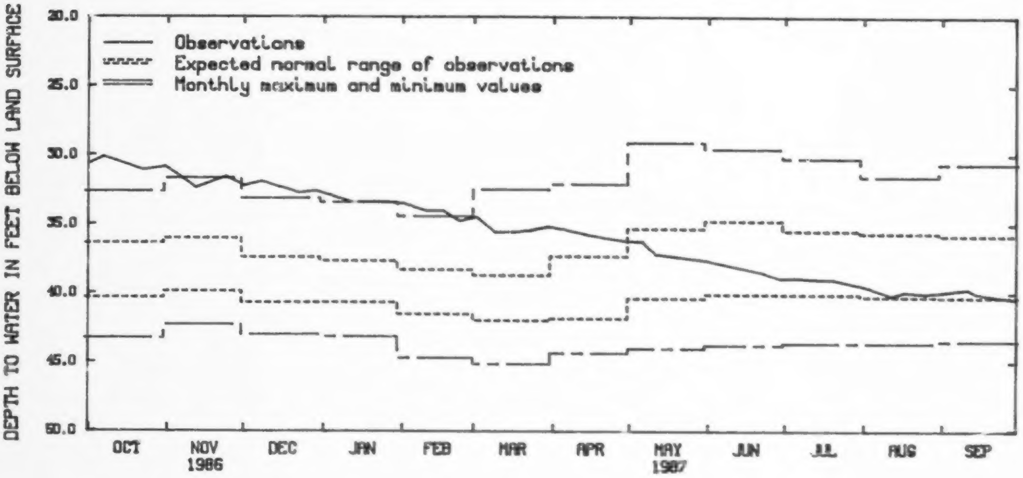
KANABEC COUNTY

455236093172301. Local number, 039N24W11DDC01.
LOCATION.--Lat 45°52'36", long 93°17'23", in SW¼SE¼SE¼ sec.11, T.39 N., R.24 W., Hydrologic Unit 07030004, intersection of Forest Avenue and U.S. Highway 65.
Owner: City of Mora, well 3.
AQUIFER.--Buried sand and gravel of Pleistocene Age.
WELL CHARACTERISTICS.--Drilled public-supply artesian well, diameter 12 in. (0.30 m), depth 170 ft (51.8 m), screened 150 to 170 ft (45.7 to 51.8 m).
DATUM.--Altitude of land-surface datum is 1,011 ft (308 m). Measuring point: Edge of vent pipe, 2.40 ft (0.73 m) above land-surface datum.
PERIOD OF RECORD.--March 1968 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 30.26 ft (9.22 m) below land-surface datum, July 5, 1984; lowest, 45.18 ft (13.77 m) below land-surface datum, Mar. 15, 1982.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct. 7	30.13	Dec. 22	32.79	Feb. 17	34.10	Apr. 6	35.44	May 18	37.36	Aug. 3	39.63
22	31.13	29	32.60	23	34.81	13	35.75	June 1	37.70	12	40.21
31	30.83	Jan. 5	33.06	Mar. 2	34.50	20	36.00	22	38.53	17	39.88
Nov. 12	32.41	12	33.47	9	35.60	27	36.20	29	38.96	25	40.06
24	31.56	26	33.45	16	35.60	May 4	36.32	July 6	38.88	Sep. 1	39.90
Dec. 1	32.26	Feb. 2	33.59	23	35.43	6	36.30	13	39.02	11	39.66
8	31.89	10	34.09	30	35.17	11	37.20	20	39.03	14	40.02
										21	40.25
										30	40.46

KANABEC COUNTY--Continued



Ground-water levels, 1987 water year
Well 039N24W11DDC01

KANDIYOHI COUNTY

450730095014801. Local number, 119N35W14ABB01.

LOCATION.--Lat 45°07'30", long 95°01'48", in NW¼NW¼NE¼ sec.14, T.119 N., R.35 W., Hydrologic Unit 07020004, at Willmar.

Owner: Burlington Northern, Inc.

AQUIFER.--Buried sand and gravel of Pleistocene Age.

WELL CHARACTERISTICS.--Drilled unused artesian well, diameter 10 in. (0.25 m), depth 320 ft (97.5 m), screened 297 to 320 ft (89.9 to 97.5 m).

DATUM.--Altitude of land-surface datum is 1,140 ft (347 m). Measuring point: Wood floor of recorder shelter, 1.00 ft (0.30 m) above land-surface datum.

REMARKS.--Water level affected by pumping.

PERIOD OF RECORD.--December 1967 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level, 12.78 ft (3.90 m) below land-surface datum, May 12, 1969; lowest, 32.50 ft (9.91 m) below land-surface datum, Aug. 27, 1976.

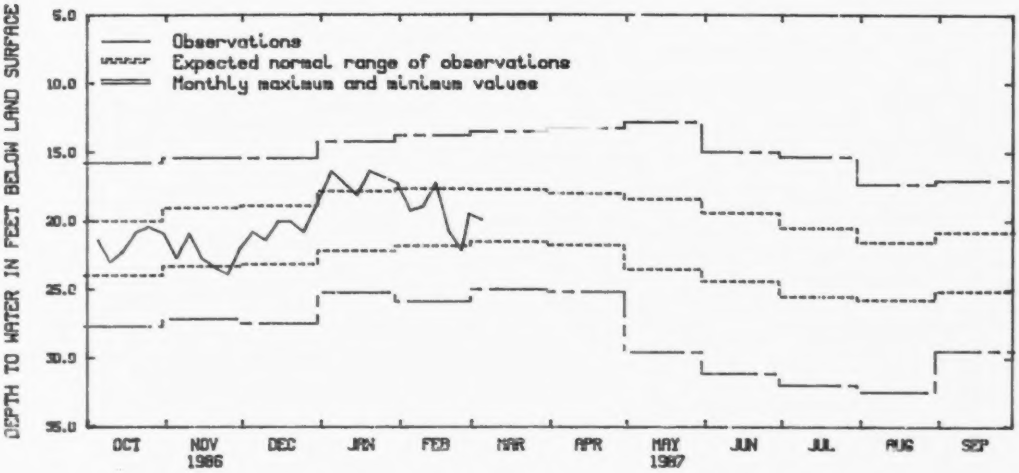
WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR
5	21.45	22.73	20.81	16.40	19.29	19.95
10	23.05	20.95	21.45	17.29	18.94	
15	22.23	22.76	20.05	18.16	17.25	
20	20.85	23.43	20.05	16.37	20.73	
25	20.43	23.94	20.86		22.14	
EOM	21.00	22.02	18.45	17.31	19.50	

May 13 well destroyed.

WTR YEAR 1987 HIGHEST 15.26 JAN. 20, 1987 LOWEST 23.68 OCT. 14, 1986

KANDIYOHI COUNTY--Continued



Ground-water levels, 1987 water year
Well 119N35W14ABB01

LE SUEUR COUNTY

442522093543901. Local number, 111N26W14ADA01.
LOCATION.--Lat 44°25'22", long 93°54'39", in NE¼SE¼NE¼ sec.14, T.111 N., R.26 W., Hydrologic Unit 07020012, 0.85 mi (1.37 km) south of Le Sueur.
Owner: Merle Moser.
AQUIFER.--Buried gravel of Pleistocene Age and Jordan Sandstone of Late Cambrian Age.
WELL CHARACTERISTICS.--Drilled irrigation artesian well, diameter 16 in. (0.41 m), depth 242 ft (73.8 m), screened 212 to 242 ft (64.6 to 73.8 m).
DATUM.--Altitude of land-surface datum is 855 ft (261 m). Measuring point: Edge of vent pipe, 1.20 ft (0.37 m) above land-surface datum.
PERIOD OF RECORD.--January 1980 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 71.82 ft (21.89 m) below land-surface datum, Feb. 11, 1987; lowest, 84.55 ft (25.77 m) below land-surface datum, Mar. 9, 1982.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Dec. 9	71.95	Feb. 11	71.82	Apr. 15	72.10	June 3	74.53	July 22	73.86	Sep. 23	73.92

443234093333501 Local number, 112N23W02BAB01.
LOCATION.--Lat 44°32'34", long 93°33'35", in NW¼NE¼NW¼ sec.2, T.112 N., R.23 W., Hydrologic Unit 07020012, just east of New Prague.
Owner: Holy Trinity Lutheran Church.
AQUIFER.--St. Lawrence Formation of Late Cambrian Age.
WELL CHARACTERISTICS.--Drilled domestic artesian well, diemeter 4 in. (0.10 m), depth 180 ft (54.9 m), cased to 155 ft (47.2 m).
DATUM.--Altitude of land-surface datum is 1,005 ft (306 m). Measuring point: Top of casing, 1.00 ft (0.30 m) above land-surface datum.
PERIOD OF RECORD.--April 1979 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 93.56 ft (28.51 m) below land-surface datum, Feb. 3, 1987; lowest, 99.42 ft (30.30 m) below land-surface datum, July 26, 1979.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Dec. 4	93.91	Feb. 3	93.56	Apr. 2	93.73	June 4	95.03	July 23	96.08	Sep. 21	95.57

LE SUEUR COUNTY--Continued

443147093374501. Local number, 112N23W06DDD01.
LOCATION.--Lat 44°31'47",long 93°37'45", in SE¼SE¼SE¼ sec.6, T.112 N., R.23 W., Hydrologic Unit 07020012, 3 mi (4.8 km) southwest of New Prague.
Owner: Friedens Lutheran Church.
AQUIFER.--St. Lawrence Formation of Late Cambrian Age.
WELL CHARACTERISTICS.--Drilled domestic artesian well, diameter 5 in. (0.13 m), depth 265 ft (80.8 m), cased to 209 ft (63.7 m).
DATUM.--Altitude of land-surface datum is 1,019 ft (311 m). Measuring point: Top of casing, 1.70 ft (0.52 m) above land-surface datum.
PERIOD OF RECORD.--April 1979 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 150.85 ft (45.97 m) below land-surface datum, Mar. 18, 1981; lowest, 152.20 ft (46.39 m) below land-surface datum, Sept. 21, 1987.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

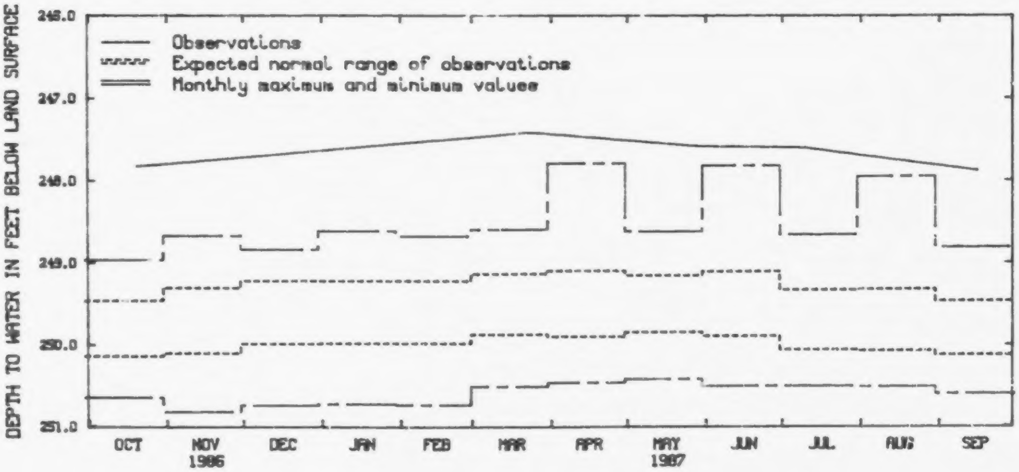
DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Dec. 4	151.00	Feb. 5	151.10	June 4	151.30	July 23	152.09	Sep. 21	152.20

LINCOLN COUNTY

441705096084501. Local number, 110N44W33DCD01.
LOCATION.--Lat 44°17'05", long 96°08'45", in SE¼SW¼SE¼ sec.33, T.110 N., R.44 W., Hydrologic Unit 07020006, at Tyler.
Owner: U.S. Geological Survey.
AQUIFER.--Dakota Sandstone of Early Cretaceous Age.
WELL CHARACTERISTICS.--Drilled observation artesian well, diameter 8 in. (0.20 m), depth 967 ft (295 m), screened 890 to 900 ft (271 to 274 m).
DATUM.--Altitude of land-surface datum is 1,738 ft (530 m). Measuring point: Top of recorder platform, 3.50 ft (1.07 m) above land-surface datum.
PERIOD OF RECORD.--November 1969 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 247.41 ft (75.41 m) below land-surface datum, Mar. 23, 1987; lowest, 250.82 ft (76.44 m) below land-surface datum, Nov. 12, 1976.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct. 20	247.83	Mar. 23	247.41	May 28	247.59	July 10	247.61	Sep. 16	247.89



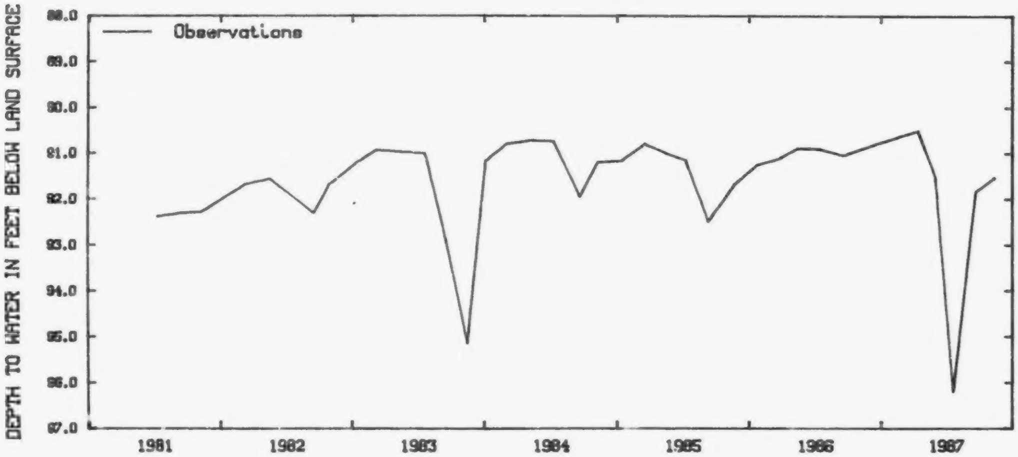
Ground-water levels, 1987 water year
Well 110N44W33DCD01

MARTIN COUNTY

434359094422201. Local number, 103N32W08CCD01.
LOCATION.--Lat 43°43'59", long 94°42'22", in SE¼SW¼SW¼ sec.8, T.103 N., R.32 W., Hydrologic Unit 07020009, 1.5 mi (2.4 km) south of Trimont.
Owner: Robert Olson.
AQUIFER.--Sandstone of Cretaceous Age.
WELL CHARACTERISTICS.--Drilled irrigation artesian well, diameter 16 in. (0.41 m), depth 412 ft (126 m), screened 372 to 412 ft (113 to 126 m).
DATUM.--Altitude of land-surface datum is 1,242 ft (379 m). Measuring point: Vent pipe, 0.50 ft (0.15 m) above land-surface datum.
PERIOD OF RECORD.--July 1981 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 90.50 ft (27.58 m) below land-surface datum, Apr. 14, 1987; lowest, 96.22 ft (29.32 m) below land-surface datum, July 21, 1987.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Dec. 8	90.82	Feb. 11	90.66	Apr. 14	90.50	June 2	91.54	July 21	96.22	Sep. 22	91.83

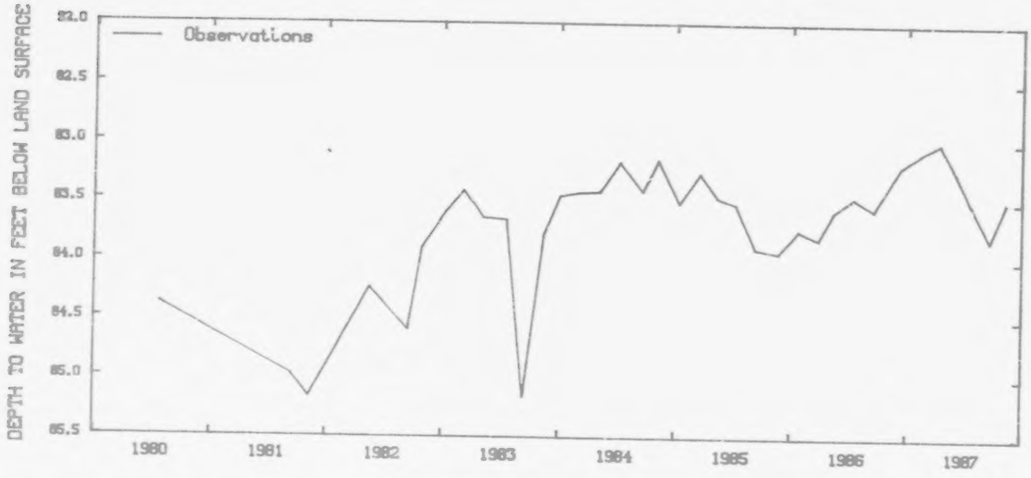


Ground-water levels, 1981-87
Well 103N32W08CCD01

434725094483001. Local number, 104N33W28BAB01.
LOCATION.--Lat 43°47'25", long 94°48'30", in NW¼NE¼NW¼ sec.28, T.104 N., R.33 W., Hydrologic Unit 07020009, 6.6 mi (10.6 km) northwest of Trimont.
Owner: Kenneth Schafer.
AQUIFER.--Sioux Quartzite of Late Precambrian Age.
WELL CHARACTERISTICS.--Drilled unused artesian well, diameter 5 in. (0.13 m), depth 178 ft (54.2 m), cased to 121 ft (36.9 m).
DATUM.--Altitude of land-surface datum is 1,290 ft (393 m). Measuring point: Top of casing, 1.30 ft (0.40 m) above land-surface datum.
PERIOD OF RECORD.--September 1981 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 82.99 ft (25.29 m) below land-surface datum, Apr. 14, 1987; lowest, 85.17 ft (25.96m) below land-surface datum, Nov. 9, 1981.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Dec. 8	83.20	Feb. 11	83.08	Apr. 14	82.99	June 2	83.23	July 21	83.50	Sep. 22	83.82



Ground-water levels, 1980-87
Well 104N33W28BAB01

MC LEOD COUNTY

444758094132101. Local number, 115N28W05ACC01.

LOCATION.--Lat 44°47'58", long 94°13'21", in SW¼SW¼NE¼ sec.5, T.115 N., R.28 W., Hydrologic Unit 07010205, northwest of Glencoe.

Owner: Graupmann Farms, Inc.

AQUIFER.--Mount Simon Sandstone of Late Cambrian Age.

WELL CHARACTERISTICS.--Drilled irrigation artesian well, diameter 12 in. (0.30 m), depth 472 ft (144 m), screened 432 to 472 ft (132 to 144 m).

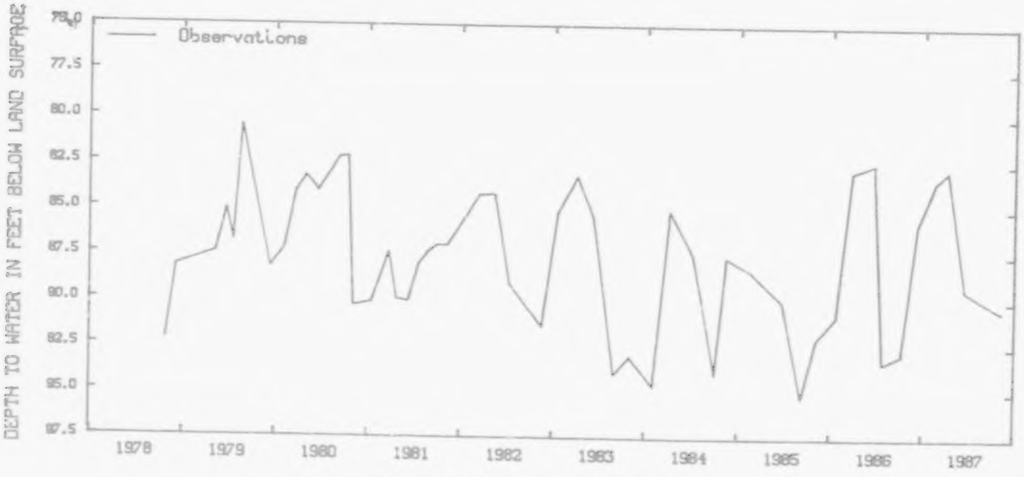
DATUM.--Altitude of land-surface datum is 1,036 ft (316 m). Measuring point: Edge of vent pipe, 2.00 ft (0.61 m) above land-surface datum.

PERIOD OF RECORD.--September 1978 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level, 80.50 ft (24.54 m) below land-surface datum, Aug. 20, 1979; lowest, 109.65 ft (33.42 m) below land-surface datum, Oct. 1, 1979.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct. 10	92.86	Dec. 10	85.78	Feb. 18	83.40	Apr. 8	82.79	June 17	89.35	Sep. 10	100.33



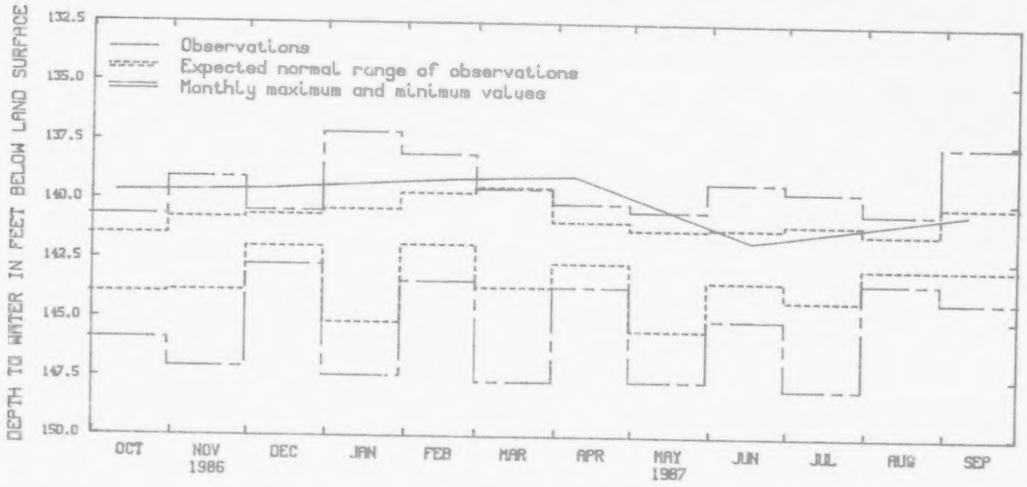
Ground-water levels, 1978-87
Well 115N28W05ACC01

MC LEOD COUNTY--Continued

444704094090801. Local number, 115N28W11ADD01.
LOCATION.--Lat 44°47'04", long 94°09'08", in SE¼SE¼NE¼ sec.11, T.115 N., R.28 W., Hydrologic Unit 07010205, 0.4 mi (0.6 km) north of Glencoe.
Owner: Mc Leod County Highway Department.
AQUIFER.--Mount Simon Sandstone of Late Cambrian Age.
WELL CHARACTERISTICS.--Drilled domestic artesian well, diameter 5 in. (0.13 m), depth 500 ft (152 m), cased to 446 ft (136 m).
DATUM.--Altitude of land-surface datum is 1,020 ft (311 m). Measuring point: Top of casing, 1.00 ft (0.30 m) above land-surface datum.
PERIOD OF RECORD.--November 1972 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 137.15 ft (41.80 m) below land-surface datum, Jan. 7, 1982; lowest, 147.98 ft (45.10 m) below land-surface datum, July 18, 1979.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct. 10	139.70	Dec. 10	139.54	Feb. 18	139.13	Apr. 8	138.97	June 17	141.73	Sep. 10	140.45



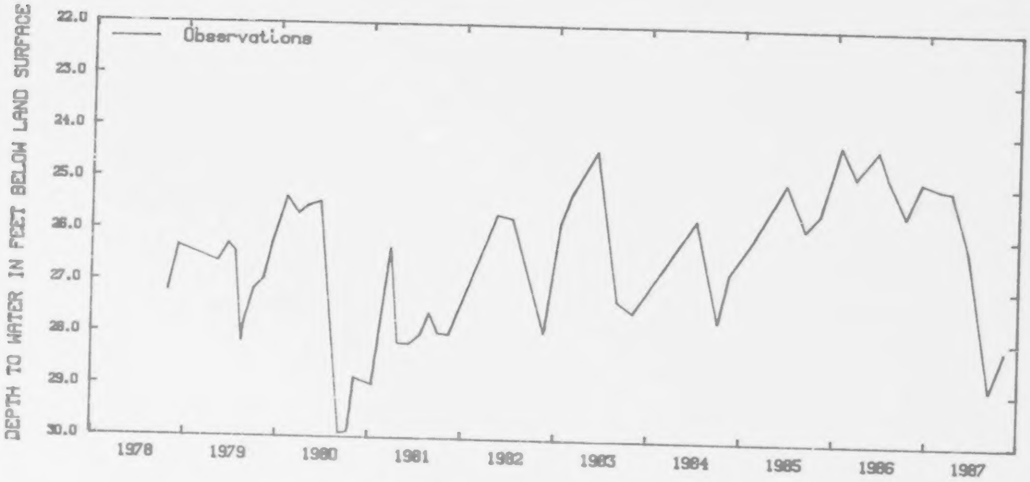
Ground-water levels, 1987 water year
Well 115N28W11ADD01

444819094164701. Local number, 116N29W35DDC01.
LOCATION.--Lat 44°48'19", long 94°16'47", in SW¼SE¼SE¼ sec.35, T.116 N., R.29 W., Hydrologic Unit 07010205, 1.3 mi (2.1 km) south of Biscay.
Owner: Charles Johnson.
AQUIFER.--Buried sand of Pleistocene Age.
WELL CHARACTERISTICS.--Drilled irrigation artesian well, diameter 12 in. (0.30 m), depth 269 ft (82.0 m), screened 229 to 269 ft (69.8 to 82.0 m).
DATUM.--Altitude of land-surface datum is 1,050 ft (320 m). Measuring point: Edge of vent pipe, 1.00 ft (0.30 m) above land-surface datum.
PERIOD OF RECORD.--September 1978 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 24.21 ft (7.37 m) below land-surface datum, Jan. 23, 1986; lowest, 29.93 ft (9.12 m) below land-surface datum, Sept. 9, 1980.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct. 10	25.57	Dec. 10	24.88	Feb. 18	25.02	Apr. 8	25.06	June 17	26.24	Sep. 10	28.93

MC LEOD COUNTY--Continued



Ground-water levels, 1978-87 water year
Well 116N29W35DDC01

445721094031201. Local number 117N27W10DAA01.
LOCATION.--Lat 44°57'21", long 94°03'12", in NE¼NE¼SE¼ sec.10, T.117 N., R.27 W., Hydrologic Unit 07010205, 0.1 mi (0.2 km) south of Winsted.
Owner: Winsted Farmers Coop.
AQUIFER.--Buried sand of Pleistocene Age.
WELL CHARACTERISTICS.--Drilled industrial artesian well, diameter 4 in. (0.10 m), depth 129 ft (39.3 m), screened 125 to 129 ft (38.1 to 39.3 m).
DATUM.--Altitude of land-surface datum is 1,015 ft (309 m). Measuring point: Top of casing, 1.40 ft (0.43 m) above land-surface datum.
PERIOD OF RECORD.--November 1977 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 30.63 ft (9.33 m) below land-surface datum, Dec. 10, 1986; lowest, 41.52 ft (12.66 m) below land-surface datum, Nov. 3, 1977.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct. 10	31.73	Dec. 10	30.63	Feb. 18	32.12	Apr. 6	32.18	June 17	34.35

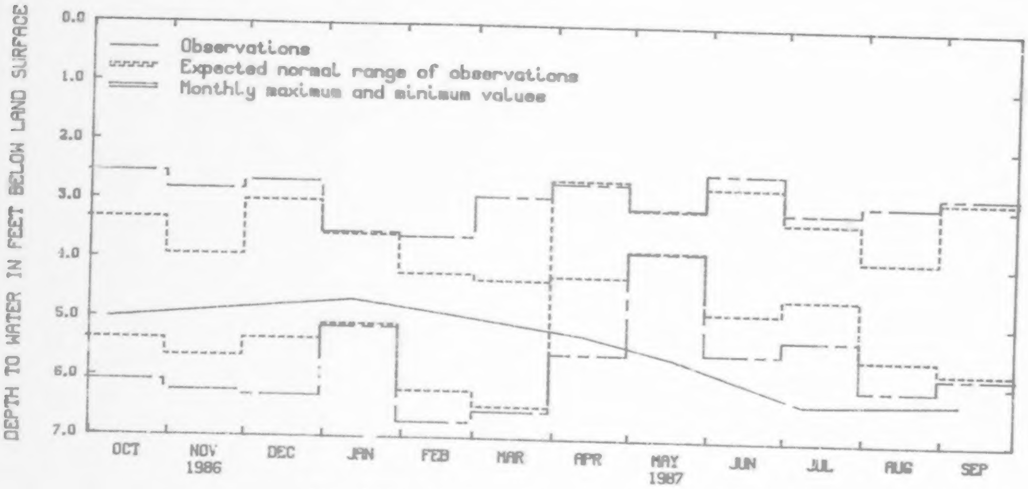
MEEKER COUNTY

450632094290801. Local number, 119N30W19AAB01.
LOCATION.--Lat 45°06'32", long 94°29'08", in NW¼NE¼NE¼ sec.19, T.119 N., R.30 W., Hydrologic Unit 07010204, on Ted Carlson farm.
Owner: U.S. Geological Survey.
AQUIFER.--Surficial sand of Pleistocene Age.
WELL CHARACTERISTICS.--Bored observation water-table well, diameter 1½ in. (0.04 m), depth 26 ft (7.9 m), screened 24 to 26 ft (7.3 to 7.9 m).
DATUM.--Altitude of land-surface datum is 1,130 ft (344 m). Measuring point: Top of casing, 3.30 ft (1.01 m) above land-surface datum.
PERIOD OF RECORD.--November 1977 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 2.47 ft (1.75 m) below land-surface datum, June 14, 1983; lowest 6.74 ft (2.05 m) below land-surface datum, Feb. 3, 1981.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct. 8	5.02	Jan. 12	4.67	Apr. 13	5.25	May 19	5.63	July 9	6.37	Sep. 8	6.30

MEEKER COUNTY--Continued



Ground-water levels, 1987 water year
Well 119N30W19AAB01

451542094322301. Local number, 121N31W26BDC01.
LOCATION.--Lat 45°15'42", long 94°32'23", in SW¼SE¼NW¼ sec.26, T.121 N., R.31 W., Hydrologic Unit 07010204, on Keith Langmo farm.
Owner: U.S. Geological Survey.
AQUIFER.--Surficial sand of Pleistocene Age.
WELL CHARACTERISTICS.--Bored observation water-table well, diameter 1¼ in. (0.04 m), depth 16 ft (4.9 m), screened 14 to 16 ft (4.3 to 4.9 m).
DATUM.--Altitude of land-surface datum is 1,112 ft (339 m). Measuring point: Top of casing, 3.00 ft (0.91 m) above land-surface datum.
PERIOD OF RECORD.--November 1977 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 2.70 ft (0.82 m) below land-surface datum, Aug. 18, 1986; lowest, 6.89 ft (2.10 m) below land-surface datum, Sept. 8, 1987.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct. 8	3.06	Jan. 12	4.96	Apr. 13	4.69	May 19	5.67	July 9	6.53	Sep. 8	6.89

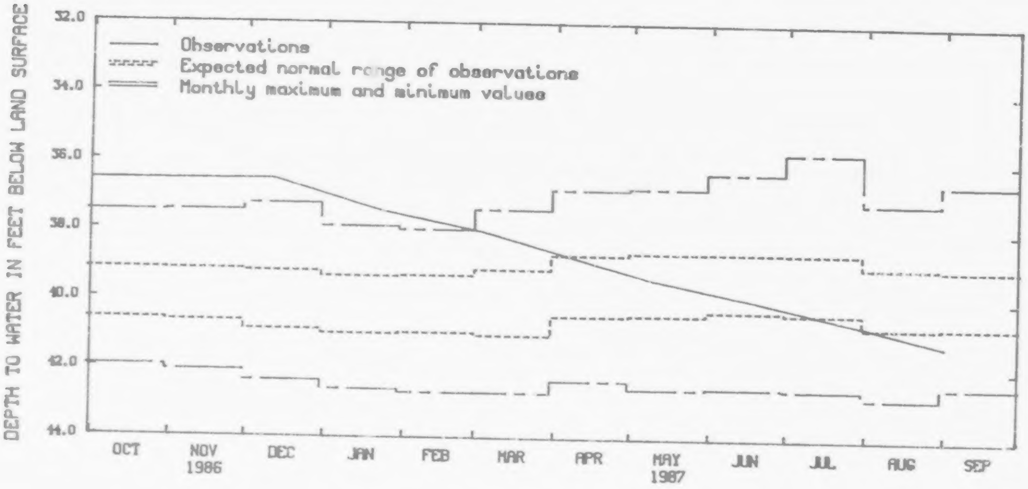
MILLE LACS COUNTY

454450093395701. Local number, 038N27W35ABC01.
LOCATION.--Lat 45°44'50", long 93°39'57", in SW¼NW¼NE¼ sec.35, T.38 N., R.27 W., Hydrologic Unit 07010207, in Milaca.
Owner: City of Milaca, creamery well.
AQUIFER.--Buried sand and gravel of Pleistocene Age.
WELL CHARACTERISTICS.--Drilled unused artesian well, diameter 12 in. (0.30 m), depth 82 ft (25.0 m), screened 67 to 82 ft (20.4 to 25.0 m).
DATUM.--Land-surface datum is 1,082.2 ft (329.8 m) National Geodetic Vertical Datum of 1929. Measuring point: Top of breather pipe, 4.00 ft (1.21 m) above land-surface datum.
REMARKS.--Water level affected by pumping.
PERIOD OF RECORD.--September 1967 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 35.72 ft (10.89 m) below land-surface datum, July 20, 1984; lowest, 42.81 ft (13.05 m) below land-surface datum, Aug. 27, 1977.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Dec. 11	36.53	Jan. 22	37.45	Mar. 4	38.06	May 8	39.39	June 19	40.01	Aug. 7	40.82

MILLE LACS COUNTY--Continued



Ground-water levels, 1987 water year
Well 038N27W35ABC01

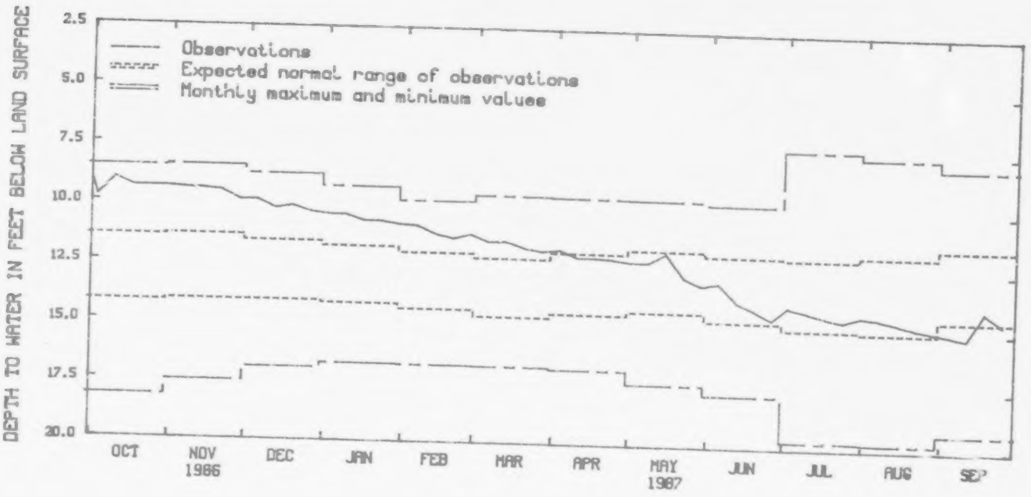
MORRISON COUNTY

460444094212501. Local number, 130N29W08DCC01.
LOCATION.--Lat 46°04'44", long 94°21'25", in SW¼SW¼SE¼ sec.8, T.130 N., R.29 W., Hydrologic Unit 07010104, at Camp Ripley.
Owner: U.S. Geological Survey.
AQUIFER.--Surficial outwash sand and gravel of Pleistocene Age.
WELL CHARACTERISTICS.--Drilled observation water-table well, diameter 2 in. (0.05 m), depth 59 ft (18.0 m), screened 56 to 59 ft (17.1 to 18.0 m).
DATUM--Land-surface datum is 1,149.0 ft (350.2 m) National Geodetic Vertical Datum of 1929. Measuring point: Top of casing, 2.10 ft (0.64 m) above land-surface datum.
REMARKS.--Water levels used in monthly Water Resources Review.
PERIOD OF RECORD.--April 1949 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 7.35 ft (2.24 m) below land-surface datum, July 28, 1972; lowest, 19.75 ft (6.02 m) below land-surface datum, Aug. 4, 1961.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct. 3	9.81	Dec. 5	9.88	Feb. 6	10.89	Apr. 3	11.77	June 5	13.02	Aug. 7	14.42
10	9.04	12	10.25	13	11.23	10	12.10	12	13.83	14	14.60
17	9.39	19	10.10	20	11.41	17	12.10	19	14.15	21	14.79
24	9.39	26	10.38	27	11.20	24	12.15	26	14.55	Sep. 4	15.05
31	9.38	Jan. 2	10.47	Mar. 6	11.53	May 1	12.26	July 2	13.97	11	15.20
Nov. 7	9.44	9	10.47	13	11.47	8	12.25	10	14.20	18	14.00
14	9.46	16	10.72	20	11.76	15	11.81	17	14.40	25	14.56
21	9.53	23	10.72	27	11.89	22	12.84	24	14.57		
28	9.91	30	10.85			29	13.18	31	14.31		

MORRISON COUNTY--Continued



Ground-water levels, 1987 water year
Well 130N29W08DCC01

MOWER COUNTY

434010093010801. Local number, 102N16W05ACB01.
LOCATION.--Lat 43°40'10", long 93°01'08", in NW¼SW¼NE¼ sec.5, T.102 N., R.18 W., Hydrologic Unit 07080201, in Austin.
Owner: Church of Latter Day Saints.
AQUIFER.--Cedar Valley Formation of Middle Devonian Age.
WELL CHARACTERISTICS.--Drilled domestic artesian well, diameter 5 in. (0.13 m), depth 100 ft (30.5 m), cased to 77 ft (23.5 m).
DATUM.--Altitude of land-surface datum is 1,230 ft (375 m). Measuring point: Top of casing, 0.80 ft (0.24 m) above land-surface datum.
PERIOD OF RECORD.--July 1981 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 33.69 ft (10.27 m) below land-surface datum, May 10, 1984; lowest, 38.44 ft (11.71 m) below land-surface datum, July 10, 1985.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

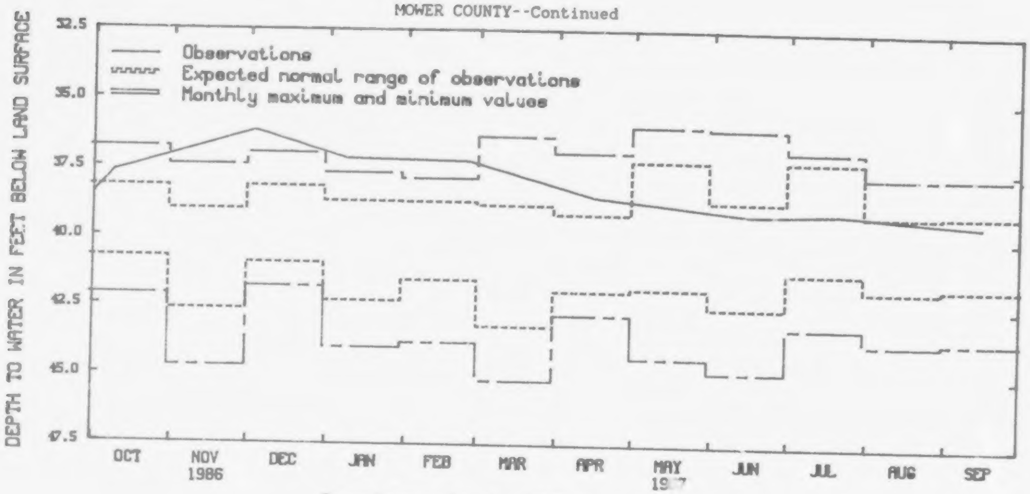
DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Dec. 8	35.09	Feb. 12	36.28	Apr. 14	36.32	June 2	37.10	July 21	37.55	Sep. 22	37.19

434417093521001. Local number, 103N17W09DAA01.
LOCATION.--Lat 43°44'17", long 93°52'10", in NE¼NE¼SE¼ sec.9, T.103 N., R.17 W., Hydrologic Unit 07080201, in Brownsdale.
Owner: Land O'Lakes, creamery well.
AQUIFER.--Cedar Valley Formation of Middle Devonian Age.
WELL CHARACTERISTICS.--Drilled unused artesian well, diameter 4 in. (0.10 m), depth 130 ft (39.6 m), casing information not available.
DATUM.--Altitude of land-surface datum is 1,280 ft (390 m). Measuring point: Top of well cap, 0.40 ft (0.12 m) above land-surface datum.
REMARKS.--Water level affected by pumping.
PERIOD OF RECORD.--February 1976 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 35.97 ft (10.96 m) below land-surface datum, May 2, 1984; lowest, 45.20 ft (13.78 m) below land-surface datum, Mar. 30, 1978.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct. 9	37.67	Jan. 8	37.18	Apr. 16	38.54	June 16	39.14	July 21	39.01	Sep. 15	39.42
Dec. 3	36.17	Feb. 25	37.26								

MOWER COUNTY--Continued



Ground-water levels, 1987 water year
Well 103N17W09DAA01

OLMSTED COUNTY

435920092273801. Local number, 106N14W14ADB01.

LOCATION.--Lat 43°59'20", long 92°27'38", in NW¼SE¼NE¼ sec.14, T.106 N., R.14 W., Hydrologic Unit 07040004, in Rochester.

Owner: Golden Hill School Dist. #1371.

AQUIFER.--Jordan Sandstone of Late Cambrian Age.

WELL CHARACTERISTICS.--Drilled unused artesian well, diameter 6 in. (0.15 m), depth 478 ft (146 m), cased to 397 ft (121 m).

DATUM.--Altitude of land-surface datum is 1,065 ft (325 m). Measuring point: Edge of well cap, 1.80 ft (0.55 m) above land-surface datum.

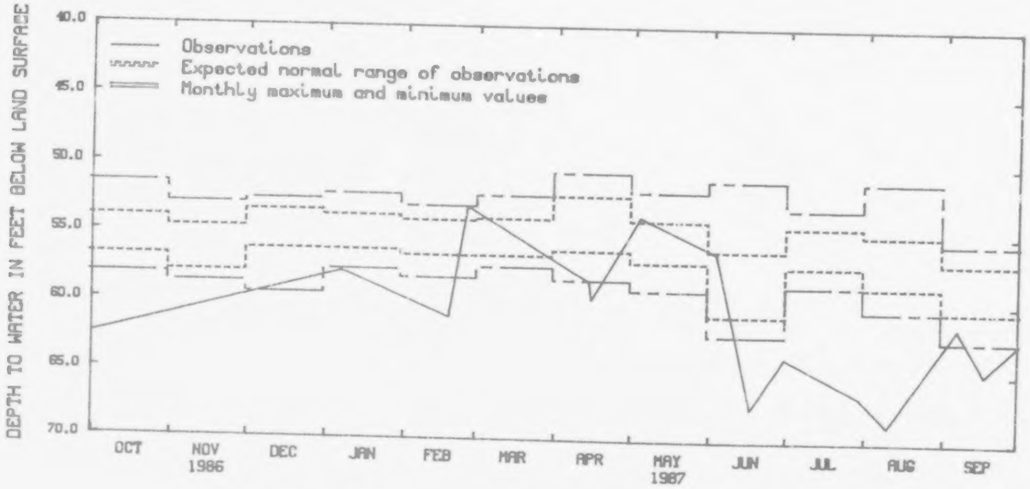
REMARKS.--Water level affected by pumping.

PERIOD OF RECORD.--August 1974 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level, 50.58 ft (15.42 m) below land-surface datum, Apr. 12, 1983; lowest, 68.79 ft (20.96 m) below land-surface datum, Aug. 10, 1987.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Jan. 7	57.84	Apr. 14	58.44	May 4	53.70	June 17	67.62	July 30	66.72	Sep. 6	61.55
Feb. 18	61.15	Apr. 15	59.75	June 3	56.33	June 30	63.81	Aug. 10	68.79	Sep. 17	64.95
Feb. 25	53.08										



Ground-water levels, 1987 water year
Well 106N14W14ADB01

RAMSEY COUNTY

445955093011001. Local number, 029N22W14CAB01.

LOCATION.--Lat 44°59'55", long 93°01'10", in NW¼NE¼SW¼ sec.14, T.29 N., R.22 W., Hydrologic Unit 07010206, at Goodrich Golf Course.

Owner: Ramsey County.

AQUIFER.--Prairie du Chien Group of Early Ordovician Age and Jordan Sandstone of Late Cambrian Age.

WELL CHARACTERISTICS.--Drilled irrigation artesian well, diameter 12 in. (0.30 m), depth 523 ft (159 m), cased to 303 ft (92.4 m).

DATUM.--Altitude of land-surface datum is 969 ft (295 m). Measuring point: Edge of vent pipe, 2.50 ft (0.76 m) above land-surface datum.

PERIOD OF RECORD.--May 1965, April 1966 to August 1966, August 1971, May 1980 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level, 124.62 ft (37.98 m) below land-surface datum, Feb. 6, 1987; lowest, 140.60 ft (42.85 m) below land-surface datum, Apr. 6, 1966.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct. 28	124.93	Apr. 3	124.82	June 9	139.25	July 28	127.19	Aug. 20	130.45	Sep. 14	127.31
Feb. 6	124.62										

445955093011002. Local number, 029N22W14CAB02.

LOCATION.--Lat 44°59'55", long 93°01'10", in NW¼NE¼SW¼ sec.14, T.29 N., R.22 W., Hydrologic Unit 07010206, at Goodrich Golf Course.

Owner: U.S. Geological Survey.

AQUIFER.--Buried gravel of Pleistocene Age.

WELL CHARACTERISTICS.--Bored observation artesian well, diameter 2 in. (0.05 m), depth 81 ft (24.7 m), screened 78 to 81 ft (23.8 to 24.7 m).

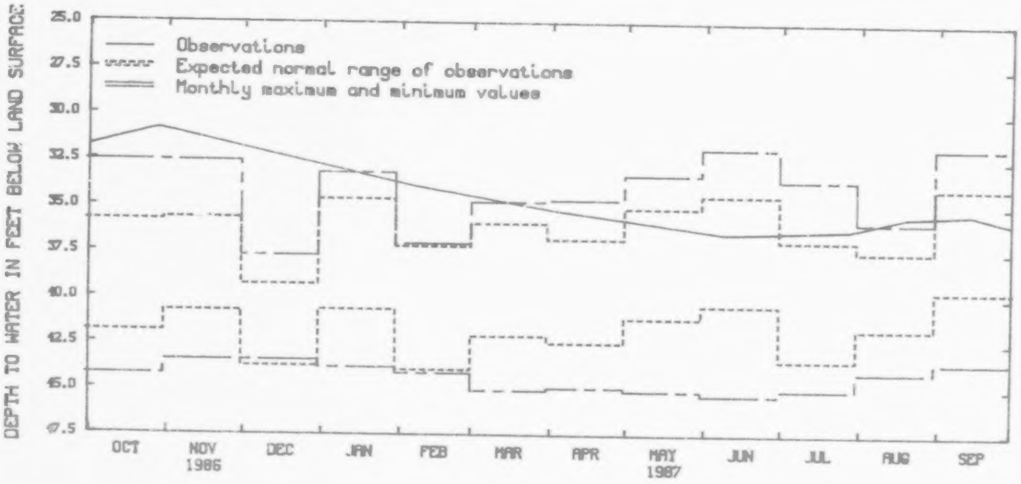
DATUM.--Altitude of land-surface datum is 970 ft (296 m). Measuring point: Top of casing, 1.30 ft (0.40 m) above land-surface datum.

PERIOD OF RECORD.--October 1966 to August 1971, August 1977, June 1980 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level, 30.80 ft (9.38 m) below land-surface datum, Oct. 28, 1986; lowest, 45.36 ft (13.83 m) below land-surface datum, June 3, 1968.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct. 28	30.80	Apr. 3	35.26	June 9	36.50	July 28	36.22	Aug. 19	35.50	Sep. 14	35.32
Feb. 6	33.92										



Ground-water levels, 1987 water year
Well 029N22W14CAB02

RAMSEY COUNTY--Continued

445955093011003. Local number, 029N22W14CAB03.
LOCATION.--Lat 44°59'55", long 93°01'10", in NW¼NE¼SW¼ sec.14, T.29 N., R.22 W., Hydrologic Unit 07010206, at Goodrich Golf Course.
Owner: U.S. Geological Survey.
AQUIFER.--Buried gravel of Pleistocene Age.
WELL CHARACTERISTICS.--Bored observation water-table well, diameter 2 in. (0.05 m), depth 52 ft (15.8 m), screened 49 to 52 ft (14.9 to 15.8 m).
DATUM.--Altitude of land-surface datum is 970 ft (296 m). Measuring point: Top of casing, 1.80 ft (0.55 m) above land-surface datum.
PERIOD OF RECORD.--October 1966 to August 1971, June 1980 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 8.97 ft (2.73 m) below land-surface datum, Oct. 28, 1986; lowest, 25.43 ft (7.75 m) below land-surface datum, June 3, 1968.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct. 28	8.97	Apr. 3	15.97	June 9	16.26	July 28	17.69	Aug. 19	16.84	Sep. 14	16.43
Feb. 6	13.00										

450001093024701. Local number, 029N22W16ADD01.
LOCATION.--Lat 45°00'01", long 93°02'47", in SE¼SE¼NE¼ sec.16, T.29 N., R.22 W., Hydrologic Unit 07010206, at 1955 English St.
Owner: Maplewood Bowl.
AQUIFER.--Buried sand of Pleistocene Age.
WELL CHARACTERISTICS.--Drilled unused artesian well, diameter 4 in. (0.10 m), depth 163 ft (49.7 m), screened 158 to 163 ft (48.2 to 49.7 m).
DATUM.--Altitude of land-surface datum is 900 ft (274 m). Measuring point: Top of well cap, 1.00 ft (0.30 m) above land-surface datum.
PERIOD OF RECORD.--January 1981 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 65.99 ft (20.11 m) below land-surface datum, Feb. 6, 1987; lowest, 73.18 ft (22.31 m) below land-surface datum, Jan. 14, 1983.

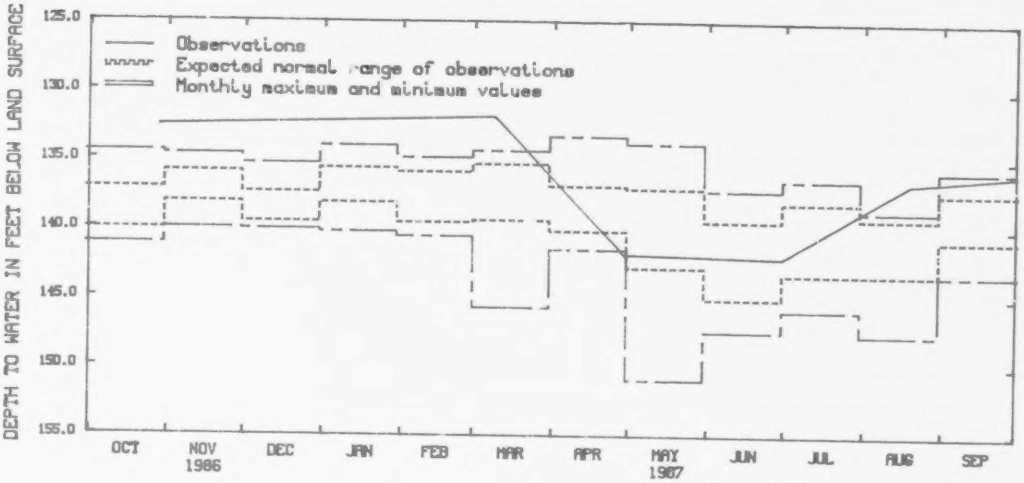
WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct. 28	66.55	Apr. 3	66.09	June 8	67.27	July 28	68.05	Aug. 19	68.20	Sep. 14	68.32
Feb. 6	65.99										

445918092590901. Local number, 029N22W24ADA01.
LOCATION.--Lat 44°59'18", long 92°59'09", in NE¼SE¼NE¼ sec.24, T.29 N., R.22 W., Hydrologic Unit 07010206, at 1555 Century Avenue.
Owner: Northern States Power Co., Maplewood Gas Plant.
AQUIFER.--Jordan Sandstone of Late Cambrian Age.
WELL CHARACTERISTICS.--Drilled fire protection artesian well, diameter 12 in. (0.30 m), depth 523 ft (159 m), cased to 420 ft (128 m).
DATUM.--Land-surface datum is 996.5 ft (303.7 m) National Geodetic Vertical Datum of 1929. Measuring point: Edge of 2 in (0.05 m) breather pipe, 2.40 ft (0.73 m) above land-surface datum.
REMARKS.--Water level affected by pumping.
PERIOD OF RECORD.--August 1970 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 131.90 ft (40.20 m) below land-surface datum, Mar. 9, 1987; lowest, 151.0 ft (46.02 m) below land-surface datum, May 14, 1981.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct. 28	132.62	Mar. 9	131.90	Apr. 29	141.89	June 30	142.13	Aug. 19	136.64



Ground-water levels, 1987 water year
Well 029N22W24ADA01

445700093051001. Local number, 029N22W31DDD01.

LOCATION.--Lat 44°57'00", long 93°05'10", in SE¼SE¼SE¼ sec.31, T.29 N., R.22 W., Hydrologic Unit 07010206, at 261 East 5th Street, St. Paul.
Owner: Control Data Corp.

AQUIFER.--Prairie du Chien Group of Early Ordovician Age and Jordan Sandstone of Late Cambrian Age.

WELL CHARACTERISTICS.--Drilled unused artesian well, diameter 12 in. (0.30 m), depth 298 ft (91 m), cased to 151 ft (46.0 m).

DATUM.--Altitude of land-surface datum is 750 ft (229 m). Measuring point: Top of recorder platform, 9.00 ft (2.74 m) below land-surface datum.

REMARKS.--Water level affected by pumping of nearby wells.

PERIOD OF RECORD.--December 1971 to current year.

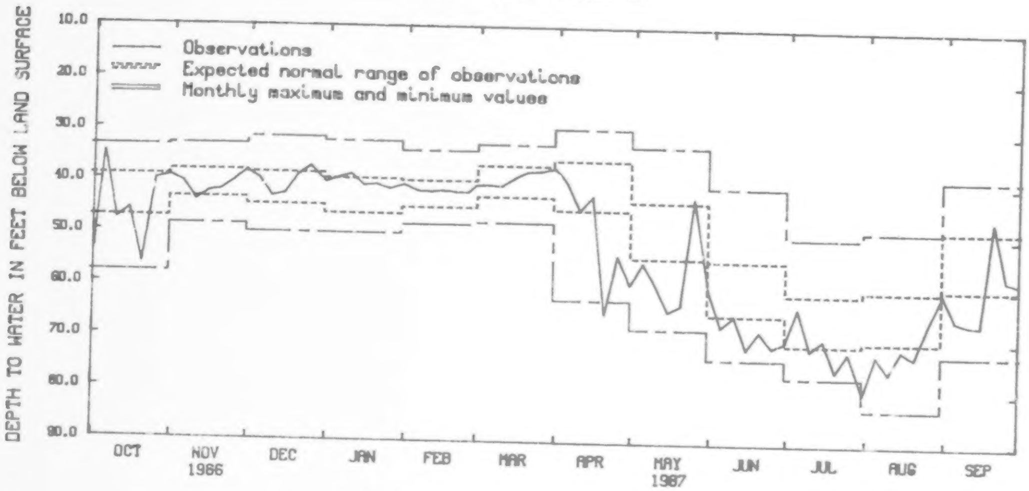
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 28.76 ft (8.76 m) below land-surface datum, Apr. 7, 1986; lowest, 83.06 ft (25.32 m) below land-surface datum, Aug. 16, 1972.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP
5	34.82	40.54	39.82	39.36	41.83	40.48	40.07	55.18	67.42	63.54	72.43	65.49
10	47.80	44.03	43.19	38.58	42.03	40.82	45.26	59.46	65.10	71.67	75.92	66.29
15	45.83	42.35	42.59	40.89	41.66	39.12	42.45	64.61	71.66	69.56	71.32	66.56
20	56.33	41.90	38.95	40.51	42.03	37.87	65.24	63.25	68.03	75.80	72.98	46.27
25	40.00	40.12	37.17	41.52	42.14	37.76	53.88	42.58	71.29	71.93	66.74	57.58
EOM	39.26	38.09	40.32	40.56	40.63	37.16	59.54	60.60	70.08	79.88	60.34	58.33

WTR YEAR 1987 HIGHEST 31.87 MAR 24, 1987 LOWEST 79.88 JUL 31, 1987

RAMSEY COUNTY--Continued



Ground-water levels, 1987 water year
Well 029N22W3'DDD01

450026093084201. Local number, 029N23W11CCC01.
LOCATION.--Lat 45°00'26", long 93°08'42", in SW¼SW¼SW¼ sec.11, T.29 N., R.23 W., Hydrologic Unit 07010206, at 2204 North Lexington Avenue, Roseville.
Owner: Lexington Court Apartments.
AQUIFER.--St. Peter Sandstone of Middle Ordovician Age.
WELL CHARACTERISTICS.--Drilled unused artesian well, diameter 6 in. (0.15 m), depth 325 ft (99.1 m), cased to 192 ft (58.5 m).
DATUM.--Altitude of land-surface datum is 945 ft (288 m). Measuring point: Top of well cap, 1.40 ft (0.43 m) above land-surface datum.
PERIOD OF RECORD.--January 1971 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 104.77 ft (31.93 m) below land-surface datum, Mar. 30, 1987; lowest, 111.19 ft (33.89 m) below land-surface datum, Aug. 18, 1975.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct. 26	105.00	Mar. 30	104.77	June 1	105.65	July 30	106.78	Aug. 20	107.04	Sep. 14	106.76
Feb. 4	105.02										

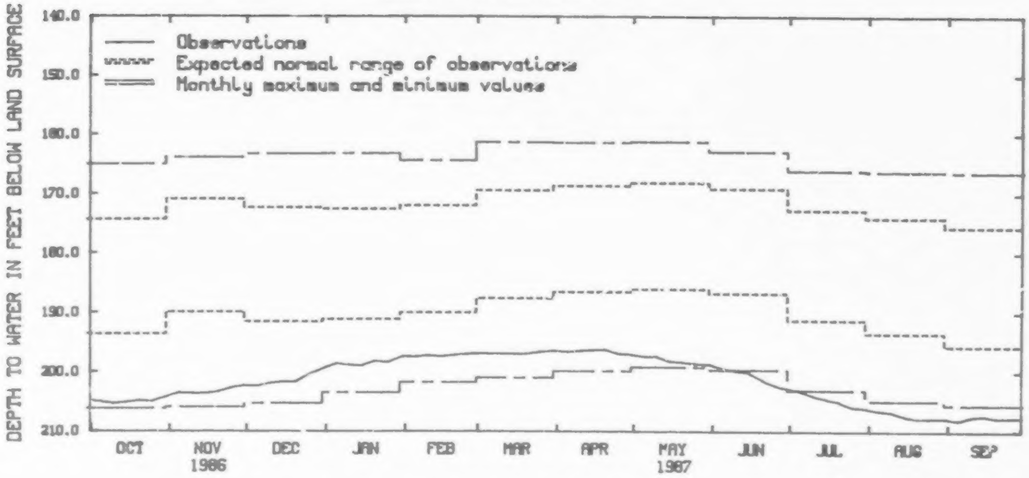
445751093072301. Local number, 029N23W25CCD01.
LOCATION.--Lat 44°57'51", long 93°07'23", SE¼SW¼SW¼ sec.25, T.29 N., R.23 W., Hydrologic Unit 07010206, at 760 North Dale Street, St. Paul.
Owner: Burlington Northern, Inc., Dale Street Shops.
AQUIFER.--Hinckley Sandstone of Late Precambrian Age.
WELL CHARACTERISTICS.--Drilled unused artesian well, diameter 8 in. (0.20 m), depth 999 ft (304 m), cased to 955 ft (291 m).
DATUM.--Land-surface datum is 859.5 ft (262.0 m) National Geodetic Vertical Datum of 1929. Measuring point: Top of recorder floor, 4.60 ft (1.40 m) above land-surface datum.
REMARKS.--Water level affected by pumping.
PERIOD OF RECORD.--December 1970, November 1976 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 161.05 ft (49.08 m) below land-surface datum, May 10, 1980; lowest, 208.33 ft (63.49 m) below land-surface datum, Aug. 22, 1987.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP
5	205.15	203.42	202.46	198.59	197.56	196.96	196.74	197.50	199.55	203.22	206.63	208.24
10	205.47	203.74	201.91	198.96	197.24	196.92	196.40	197.52	199.88	204.04	206.85	207.48
15	205.12	203.63	201.63	199.08	197.53	197.02	196.30	198.31	200.15	204.61	207.52	207.24
20	204.85	203.31	201.80	198.13	197.16	197.04	196.23	198.48	201.36	205.07	207.92	207.77
25	205.11	202.63	200.45	198.50	196.97	196.63	197.04	198.74	202.32	205.96	207.88	207.79
EOM	204.08	202.27	199.37	197.36	196.89	196.40	197.15	198.84	202.85	206.23	207.79	207.61

WTR YEAR 1987 HIGHEST 195.93 APR. 20, 1987 LOWEST 208.33 AUG. 22, 1987

RAMSEY COUNTY--Continued



Ground-water levels, 1987 water year
Well 029N23W25CCD01

445739093081201. Local number, 029N23W35BAD01.

LOCATION.--Lat 44°57'39", long 93°08'12", in SE¼NE¼NW¼ sec.35, T.29 N., R.23 W., Hydrologic Unit 07010206, Victoria Street, 0.35 mi (0.56 km) north of University Avenue.
Owner: City of St. Paul.

AQUIFER.--St. Peter Sandstone of Middle Ordovician Age.

WELL CHARACTERISTICS.--Drilled unused water-table well, diameter 16 in. (0.41 m), depth 234 ft (71.3 m), screened 174 to 234 ft (53.0 to 71.3 m).

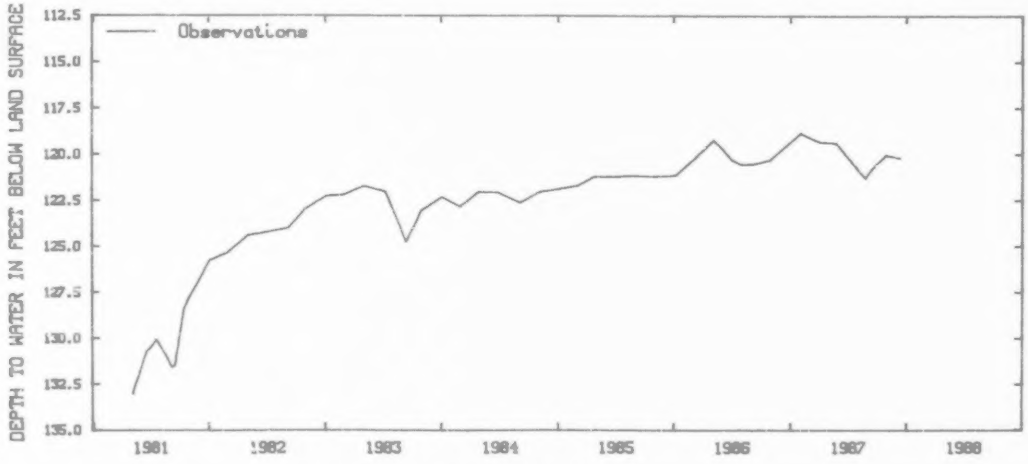
DATUM.--Altitude of land-surface datum is 888 ft (261 m). Measuring point: Top of coupling, 0.50 ft (0.15 m) above land-surface datum.

PERIOD OF RECORD.--May 1981 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level, 118.83 ft (36.21 m) below land-surface datum, Feb. 2, 1987; lowest, 133.03 ft (40.54 m) below land-surface datum, May 5, 1981.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct. 29	120.28	Mar. 30	119.34	May 26	119.44	July 27	120.74	Aug. 24	121.30	Sep. 14	120.76
Feb. 2	118.83										



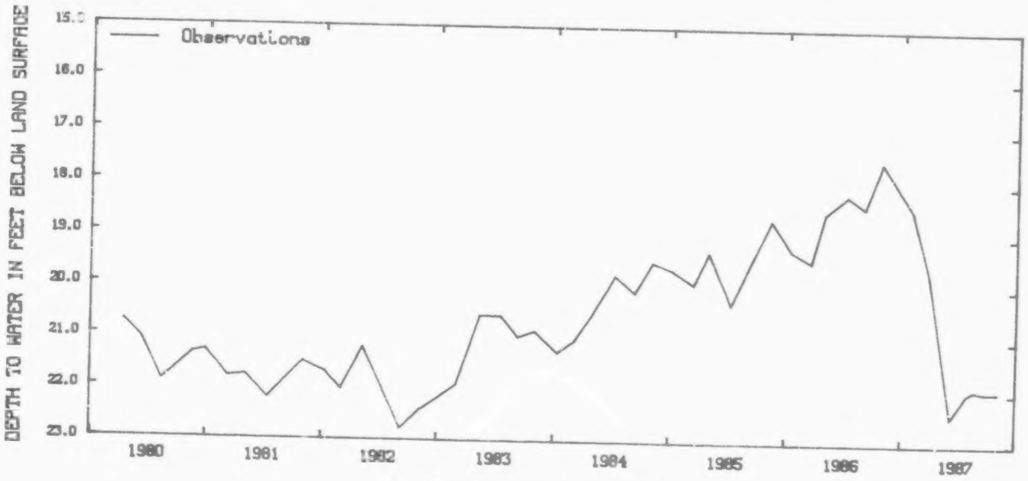
Ground-water levels, 1981-87
Well 029N23W35BAD01

RAMSEY COUNTY--Continued

450414093012701. Local number, 030N22W23CBB01.
LOCATION.--Lat 45°04'14", long 93°01'27", in NW¼NW¼SW¼ sec.23, T.30 N., R.22 W., Hydrologic Unit 07010206, Hoffman Road, 0.85 mi (1.4 km) southwest of Highway 61.
Owner: White Bear Town Hall.
AQUIFER.--Buried sand of Pleistocene Age.
WELL CHARACTERISTICS.--Drilled domestic artesian well, diameter 4 in. (0.10 m), depth 96 ft (29.3 m), screened 91 to 96 ft (27.7 to 29.3 m).
DATUM.--Altitude of land-surface datum is 928 ft (283 m). Measuring point: Top of casing, 1.00 ft (0.30 m) above land-surface datum.
PERIOD OF RECORD.--April 1980 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 17.54 ft (5.34 m) below land-surface datum, Oct. 28, 1986; lowest, 22.80 ft (6.95 m) below land-surface datum, Sept. 8, 1982.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct. 28	17.54	Mar. 30	19.74	June 9	22.47	July 28	22.00	Aug. 19	21.91	Sep. 24	21.96
Feb. 4	18.49										

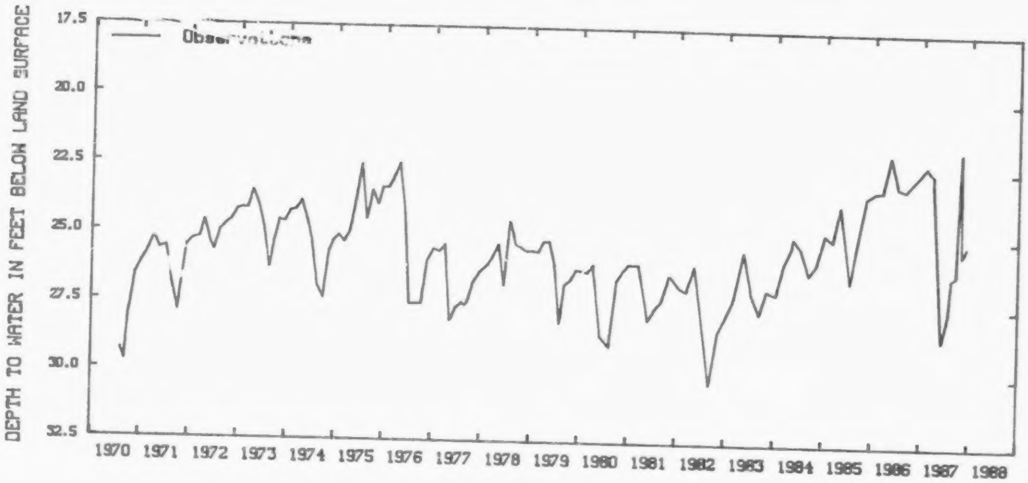


Ground-water levels, 1980-87
Well 030N22W23CBB01

450723093071801. Local number, 030N23W01BAB01.
LOCATION.--Lat 45°07'23", long 93°07'18", in NW¼NE¼NW¼ sec.1, T.30 N., R.23 W., Hydrologic Unit 07010206, at Bucher Playground.
Owner: City of Shoreview.
AQUIFER.--Prairie du Chien Group of Early Ordovician Age.
WELL CHARACTERISTICS.--Drilled recreation artesian well, diameter 8 in (0.20 m), depth 155 ft (47.2 m), cased to 101 ft (30.8 m).
DATUM.--Altitude of land-surface datum is 900 ft (274 m). Measuring point: Top of breather pipe, 2.40 ft (0.73 m) above land-surface datum.
PERIOD OF RECORD.--August 1970 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 21.74 ft (6.62 m) below land-surface datum, Oct. 28, 1986; lowest, 30.35 ft (9.25 m) below land-surface datum, Sept. 8, 1982.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct. 28	21.74	Mar. 30	22.60	June 9	28.63	July 28	27.58	Aug. 20	26.32	Sep. 24	26.18
Feb. 4	22.27										



Ground-water levels, 1970-87
Well 030N23W01BAB01

450238093082501. Local number, 030N23W35BDC01.

LOCATION.--Lat 45°02'38", long 93°08'25", in SW¼SE¼NW¼ sec.35, T.30 N., R.23 W., Hydrologic Unit 07010206, southeast corner of Arbogast Street and Richmond Avenue.
Owner: City of Shoreview.

AQUIFER.--Jordan Sandstone of Late Cambrian Age.

WELL CHARACTERISTICS.--Drilled unused artesian well, diameter 12 in. (0.30 m), depth 510 ft (155 m), cased to 465 ft (142 m).

DATUM.--Altitude of land-surface datum is 960 ft (293 m). Measuring point: Hole in shelter floor, 1.50 ft (0.46 m) above land-surface datum.

PERIOD OF RECORD.--April 1979 to current year.

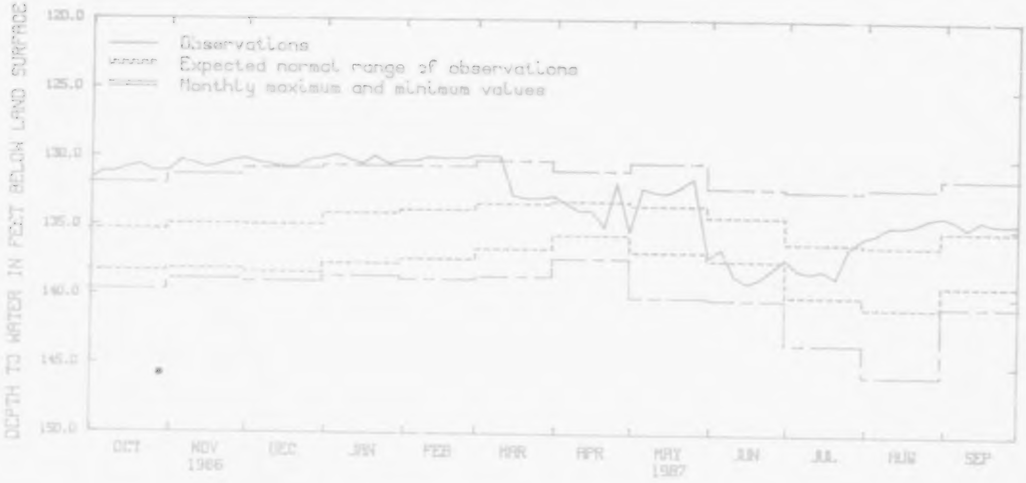
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 129.26 ft (39.39 m) below land-surface datum, Mar. 1, 1987; lowest, 145.94 ft (44.48 m) below land-surface datum, Aug. 21, 1982.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP
5	131.15	130.26	130.46	129.81	130.30	129.93	133.34	132.18	136.55	138.09	135.40	134.41
10	131.17	130.55	130.61	130.23	129.97	129.97	133.90	132.52	138.48	138.30	134.81	134.98
15	130.80	130.83	130.78	130.55	130.12	132.77	133.81	132.59	139.09	138.05	134.89	134.33
20	130.60	130.56	130.72	129.91	130.04	133.02	135.04	132.07	138.69	138.66	134.71	134.64
25	131.13	130.28	130.21	130.52	130.06	132.99	131.81	131.44	137.99	136.48	134.28	134.69
EOM	131.05	130.14	130.07	130.24	129.83	132.79	135.38	137.26	137.24	135.64	134.04	134.64

WTR YEAR 1987 HIGHEST 129.26 MAR 1, 1987 LOWEST 139.66 JUN 19, 1987

RAMSEY COUNTY--Continued



Ground-water levels, 1987 water year
Well 030N23W35BDC01

REDWOOD COUNTY

441323095280701. Local number, 109N38W30BBD01.

LOCATION.--Lat 44°13'23", long 95°28'07", in SE¼NW¼NW¼ sec.30, T.109 N., R.38 W., Hydrologic Unit 07020008, at city of Walnut Grove.

Owner: Plum Creek Cheese Co.

AQUIFER.--Sandstone of Cretaceous Age.

WELL CHARACTERISTICS.--Drilled unused artesian well, diameter 5 in. (0.13 m), depth 240 ft (73.2 m), casing depth not available.

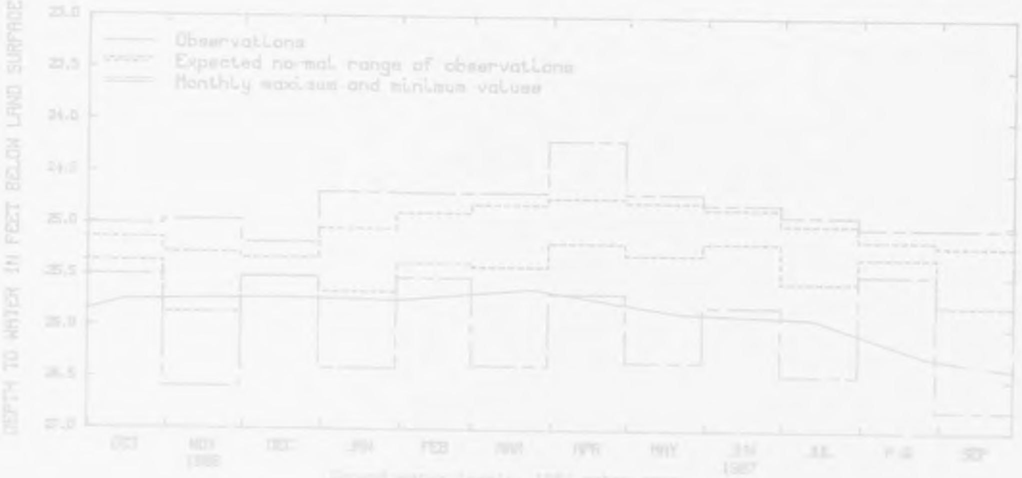
DATUM.--Altitude of land-surface datum is 1,218 ft (371 m). Measuring point: Top of well seal, 0.55ft (0.17 m) above land-surface datum.

PERIOD OF RECORD.--August 1976 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level, 24.20 ft (7.37 m) below land-surface datum, April 3, 1984; lowest, 26.80 ft (8.16 m) below land-surface datum, Sept. 26, 1984.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct. 15	25.81	Jan. 29	25.75	Mar. 24	25.63	May 22	25.67	July 13	25.92	Aug. 27	26.29
Dec. 11	25.72										



Ground-water levels, 1987 water year
Well 109N38W30BBD01

REDWOOD COUNTY--Continued

443051095074201. Local number, 112N36W14AAA01.

LOCATION.--Lat 44°30'51", long 95°07'42", in NE¼NE¼NE¼ sec.14, T.112 N., R.36 W., Hydrologic Unit 07020007, 2 mi (3.2 km) south of Redwood Falls.
Owner: Frank Boots.

AQUIFER.--Buried sand and gravel of Pleistocene Age.

WELL CHARACTERISTICS.--Drilled unused artesian well, diameter 4 in. (0.10 m), measured depth 214 ft (65.2 m), reported screened 213 to 218 ft (64.9 to 66.4 m).

DATUM.--Land-surface datum is 1,038.9 ft (316.7 m) National Geodetic Vertical Datum of 1929. Measuring point: Top of casing, 2.00 ft (0.61 m) above land-surface datum.

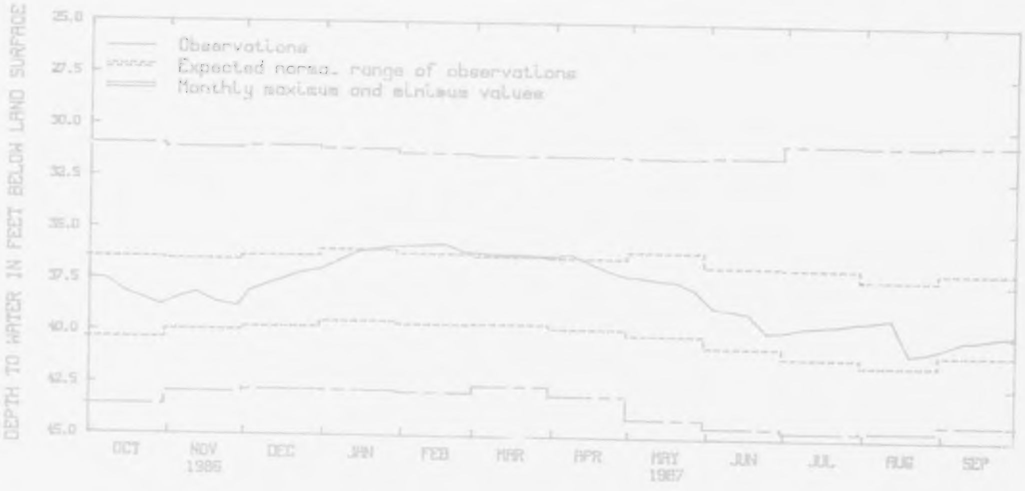
REMARKS.--Measured weekly by Michael Goebel. Water level affected by regional pumping.

PERIOD OF RECORD.--July 1952 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level, 30.72 ft (9.36 m) below land-surface datum, Sept. 10, 1953; lowest, 44.68 ft (13.62 m) below land-surface datum, July 16, 1977.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct. 1	37.48	Dec. 3	38.04	Feb. 4	35.80	Apr. 1	36.29	June 3	38.70	Aug. 5	39.23
8	37.56	10	37.68	11	35.74	8	36.14	10	38.81	12	39.11
15	38.16	17	37.41	18	35.71	15	36.56	17	38.97	19	40.87
22	38.46	23	37.12	25	36.10	22	36.90	24	39.85	26	40.72
29	38.78	31	36.96	Mar. 4	36.17	29	37.20	July 1	39.78	Sep. 2	40.49
Nov. 5	38.37	Jan. 7	36.54	11	36.23	May 6	37.28	8	39.59	9	40.16
12	38.12	14	36.11	18	36.20	13	37.41	15	39.51	16	40.10
19	38.56	21	35.97	25	36.27	20	37.47	22	39.46	23	39.96
28	38.81	28	35.83			27	37.66	29	39.31	30	39.85



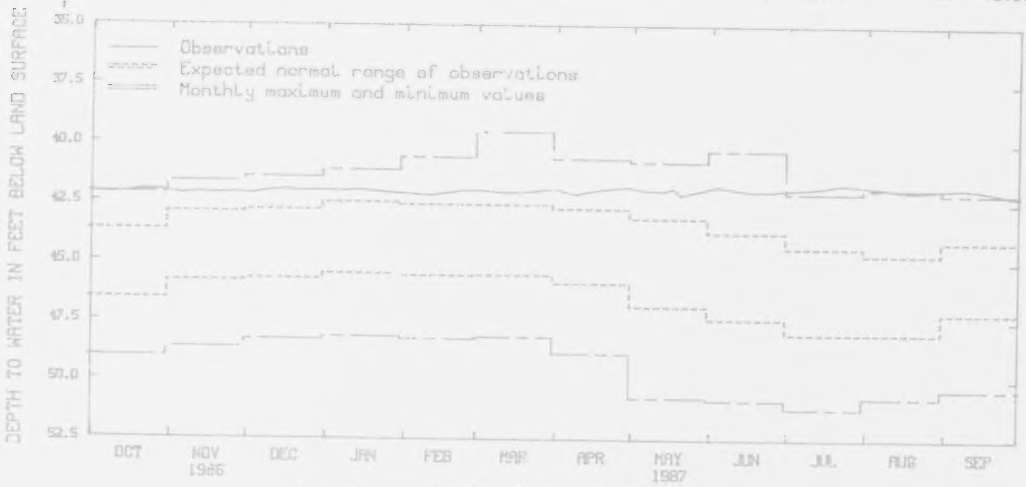
Ground-water levels, 1987 water year
Well 112N36W14AAA01

REDWOOD COUNTY--Continued

442906095064101. Local number, 112N36W24DDC01.
LOCATION.--Lat 44°29'06", long 95°06'41", in SW¼SE¼SE¼ sec.24, T.112 N., R.36 W., Hydrologic Unit 07020007, 3.6 mi 3.6 mi (5.8 km) south of Redwood Falls.
Owner: City of Redwood Falls.
AQUIFER.--Buried sand of Pleistocene Age.
WELL CHARACTERISTICS.--Drilled observation artesian well, diameter 2 in. (0.05 m), depth 144 ft (43.9 m), screened 141 to 144 ft (43.0 to 43.9 m).
DATUM.--Altitude of land-surface datum is 1,041 ft (317 m). Measuring point: Top of casing, 2.50 ft (0.76 m) above land-surface datum.
REMARKS.--Water level affected by pumping from nearby well field.
PERIOD OF RECORD.--December 1967 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 39.52 ft (12.05 m) below land-surface datum, Mar. 13, 1971; lowest, 51.21 ft (15.61 m) below land-surface datum, July 16, 1977.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct. 1	42.15	Dec. 3	42.17	Feb. 4	42.18	Apr. 1	41.92	June 3	41.78	Aug. 5	41.84
8	42.19	10	42.02	11	42.22	8	42.16	10	41.91	12	41.92
15	42.12	17	41.97	18	42.08	15	42.00	17	42.02	19	42.00
22	42.01	23	42.06	25	41.98	22	41.88	24	41.97	26	41.91
29	42.07	31	42.00	Mar. 4	42.02	29	41.82	July 1	41.92	Sep. 2	41.86
Nov. 5	42.20	Jan. 7	42.06	11	42.11	May 6	41.98	8	41.88	9	41.82
12	42.11	14	41.97	18	42.06	13	42.02	15	41.80	16	41.94
19	42.18	21	42.08	25	41.98	17	41.87	22	41.67	23	42.10
26	42.10	28	42.13			20	42.18	29	41.77	30	42.21



Ground-water levels, 1987 water year
Well 112N36W24DDC01

RENVILLE COUNTY

444437094425001. Local number, 115N32W29AAC01.
LOCATION.--Lat 44°44'37", long 94°42'50", in SW¼NE¼NE¼ sec.29, T.115 N., R.32 W., Hydrologic Unit 07010205, in Hector.
Owner: Hector Creamery.
AQUIFER.--Sandstone of Cretaceous Age.
WELL CHARACTERISTICS.--Drilled unused artesian well, diameter 8 in. (0.20 m), depth 370 ft (109 m), screened 360 to 370 ft (110 to 113 m).
DATUM.--Altitude of land-surface datum is 1,080 ft (329 m). Measuring point: Top of casing, 1.50 ft (0.46 m) above land-surface datum.
PERIOD OF RECORD.--March 1978 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 30.75 ft (9.37 m) below land-surface datum, June 16, 1986; lowest, 38.48 ft (11.73 m) below land-surface datum, Oct. 24, 1978.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct. 10	31.00	Jan. 12	31.24	Apr. 13	30.97	Aug. 31	31.30

RICE COUNTY

441912093162901. Local number, 110N20W19BDC01.
LOCATION.--Lat 44°19'12", long 93°16'29", in SW¼SE¼NW¼ sec.19, T.110 N., R.20 W., Hydrologic Unit 07040002, just north of Faribault.
Owner: St. Lawrence Cemetery Assn.
AQUIFER.--Jordan Sandstone of Late Cambrian Age.
WELL CHARACTERISTICS.--Drilled domestic artesian well, diameter 4 in. (0.10 m), depth 400 ft (122 m), cased to 357 ft (110 m).
DATUM.--Altitude of land-surface datum is 985 ft (300 m). Measuring point: Top of casing, 1.60 ft (0.49 m) above land-surface datum.
PERIOD OF RECORD.--June 1979 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 6.02 ft (1.83 m) below land-surface datum, May 2, 1984; lowest: 10.94 ft (3.33 m) below land-surface datum, July 10, 1981.

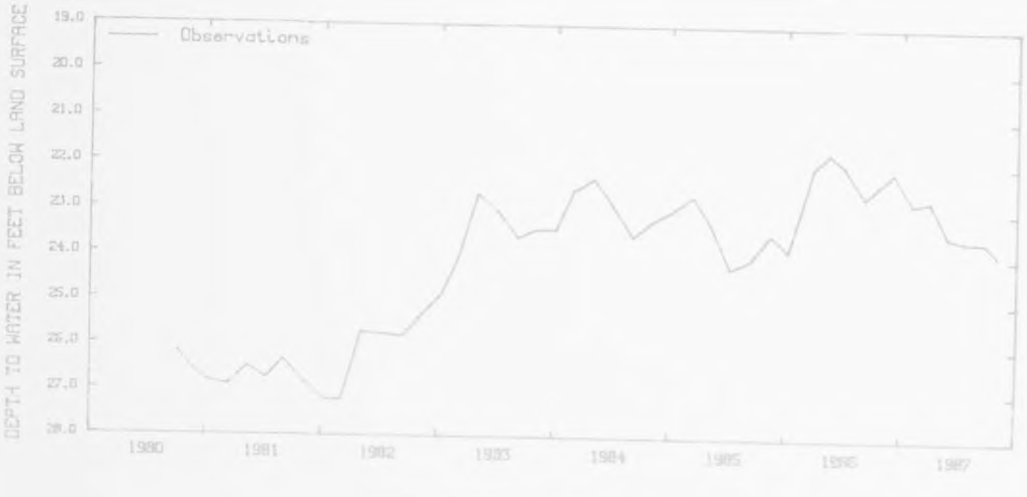
WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Dec. 4	6.40	Feb. 3	6.60	Mar. 31	6.40	May 28	7.25	July 21	8.01	Sep. 22	8.03

442543093113701. Local number, 111N20W11CDC01.
LOCATION.--Lat 44°25'43", long 93°11'37", in SW¼SE¼SW¼ sec.11, T.111 N., R.20 W., Hydrologic Unit 07040002, Highway 218 at Dundas.
Owner: Rollie Green.
AQUIFER.--Prairie du Chien Group of Early Ordovician Age.
WELL CHARACTERISTICS.--Drilled commercial artesian well, diameter 4 in. (0.10 m), depth 158 ft (48.2 m), cased to 101 ft (30.8 m).
DATUM.--Altitude of land-surface datum is 950 ft (290 m). Measuring point: Top of casing, 2.00 ft (0.61 m) above land-surface datum.
PERIOD OF RECORD.--October 1980 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 21.72 ft (6.62 m) below land-surface datum, May 14, 1986; lowest, 27.24 ft (8.30 m) below land-surface datum, Jan. 12, 1982.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Dec. 4	22.12	Feb. 3	22.82	Mar. 31	22.73	May 28	23.52	July 21	23.61	Sep. 22	23.62



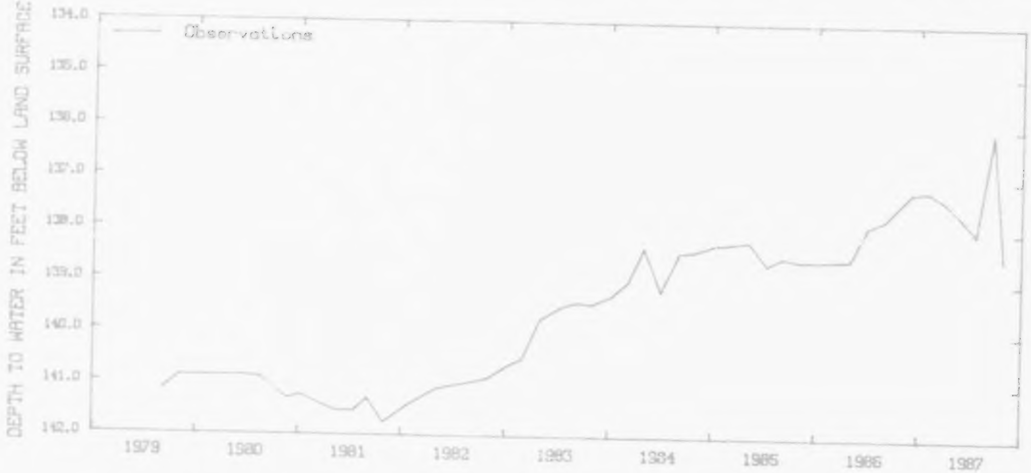
Ground-water levels, 1980-87.
Well 111N20W11CDC01

RICE COUNTY--Continued

442751093240701. Local number, 112N21W31CBB01.
LOCATION.--Lat 44°27'51", long 93°24'07", in NW¼NW¼SW¼ sec.31, T 112 N., R.21 W., Hydrologic Unit 07040002, 1.0 mi (1.6 km) south of Highway 19.
Owner: Trondhjem Church.
AQUIFER.--Prairie du Chien Group of Early Ordovician Age.
WELL CHARACTERISTICS.--Drilled domestic artesian well, diameter 4 in. (0.10 m), depth 276 ft (84.1 m), cased to 232 ft (70.7 m).
DATUM.--Altitude of land-surface datum is 1,130 ft (344 m). Measuring point: Top of casing, 1.10 ft (0.34 m) above land-surface datum.
PERIOD OF RECORD.--June 1980 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 137.7 ft (41.97 m) below land-surface datum, Sept. 4, 1986; lowest, 141.8 ft (43.22 m) below land-surface datum, Oct. 30, 1981.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Dec. 4	137.22	Feb 3	137.18	Apr. 2	137.39	June 4	137.72	July 23	138.02	Sep. 21	136.06



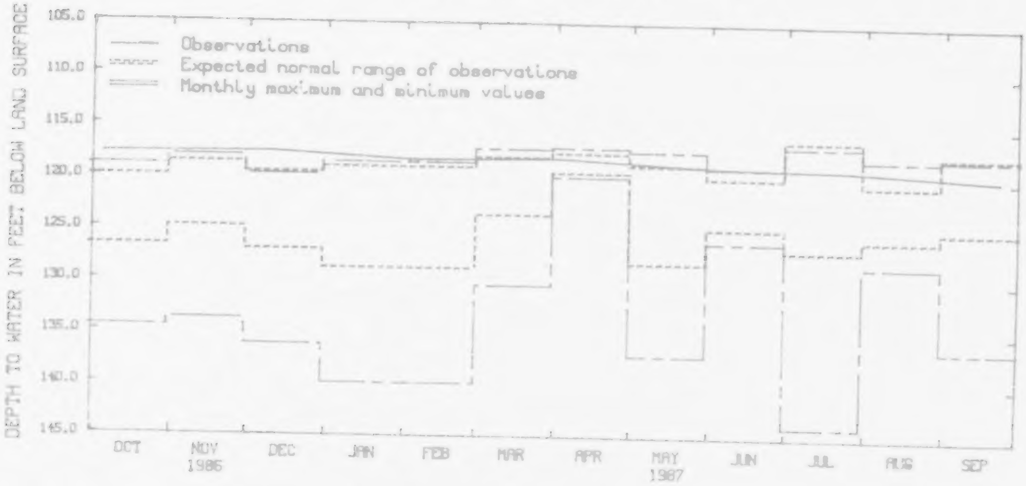
Ground-water levels, 1979-87
Well 112N21W31CBB01

SCOTT COUNTY

443732093460301. Local number, 113N24W06BCB01.
LOCATION.--Lat 44°37'32", long 93°46'03", in NW¼SW¼NW¼ sec.6, T.113 N., R.24 W., Hydrologic Unit 07020012, in Belle Plaine.
Owner: Creative Tool and Engineering. Formerly Belle Plaine Coop Creamery.
AQUIFER.--Buried sand and gravel of Pleistocene Age.
WELL CHARACTERISTICS.--Drilled unused water-table well, diameter 12 in. (0.30 m), depth 272 ft (82.9 m), screen information not available.
DATUM.--Altitude of land-surface datum is 840 ft (256 m). Measuring point: Top of well cap, 2.30 ft (0.70 m) above land-surface datum.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 116.77 ft (35.59 m) below land-surface datum, July 11, 1983; lowest, 143.95 ft (43.87 m) below land-surface datum, July 9, 1981.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Dec. 9	117.58	Feb 5	118.37	Apr. 2	118.08	June 3	118.92	July 22	119.05	Sep. 23	119.85

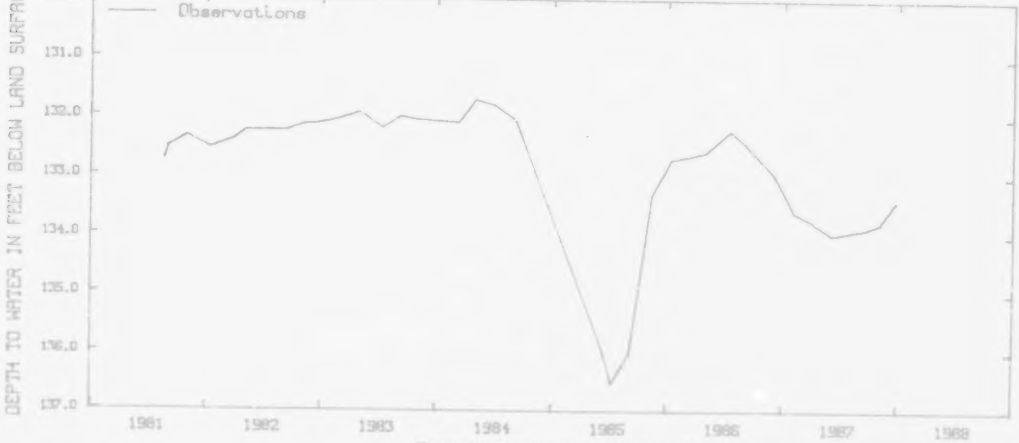


Ground-water levels, 1987 water year
Well 113N24W06BCB01

443352093423001. Local number, 113N24W28DAA01.
LOCATION.--Lat 44°33'52", long 93°42'30", in NE¼NE¼SE¼ sec.28, T.113 N., R.24 W., Hydrologic Unit 07020012, at Michelle Wildlife Area.
Owner: U.S. Geological Survey.
AQUIFER.--Ironton-Galesville Sandstones of Late Cambrian Age.
WELL CHARACTERISTICS.--Drilled observation artesian well, diameter 6 in. (0.15 m), depth 450 ft (137 m), cased to 219 ft (66.8 m).
DATUM.--Altitude of land-surface datum is 990 ft (302 m). Measuring point: Top of well seal, 2.30 ft (0.70 m) above land-surface datum.
PERIOD OF RECORD.--August 1981 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 131.70 ft (40.14 m) below land-surface datum, May 2, 1984; lowest, 136.5 ft (41.60 m) below land-surface datum, July 11, 1985.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Dec. 4	132.97	Feb. 5	133.60	Apr. 2	133.76	June 4	133.99	July 23	133.93	Sep. 21	133.87

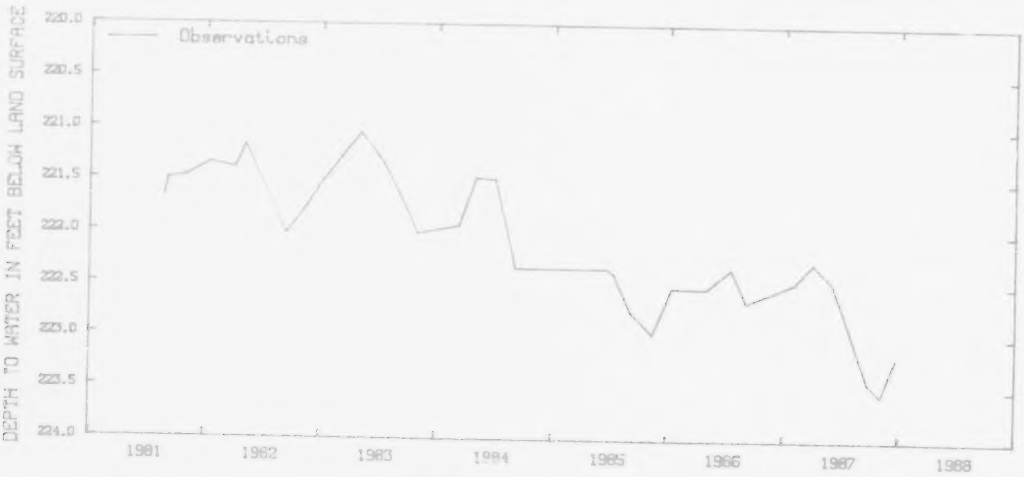


Ground-water levels, 1981-87
Well 113N24W28DAA01

443352093423002. Local number, 113N24W28DAA02.
LOCATION.--Lat 44°33'52", long 93°42'30", in NE¼NE¼SE¼ sec.28, T.113 N., R.24 W., Hydrologic Unit 07020012, at Michelle Wildlife Area.
Owner: U.S. Geological Survey.
AQUIFER.--Mount Simon Sandstone of Late Cambrian Age.
WELL CHARACTERISTICS.--Drilled observation artesian well, diameter 2 in. (0.05 m), depth 655 ft (200 m), screened 650 to 655 ft (198 to 200 m).
DATUM.--Altitude of land-surface datum is 990 ft (302 m). Measuring point: Top of casing, 3.00 ft (0.91 m) above land-surface datum.
PERIOD OF RECORD.--August 1981 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 221.1 ft (67.39 m) below land-surface datum, May 3, 1983; lowest, 223.42 ft (68.09 m) below land-surface datum, Sept. 21, 1987.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Dec. 4	222.55	Feb. 5	222.47	Apr. 2	222.28	June 4	222.49	July 23	222.90	Sep. 21	223.42



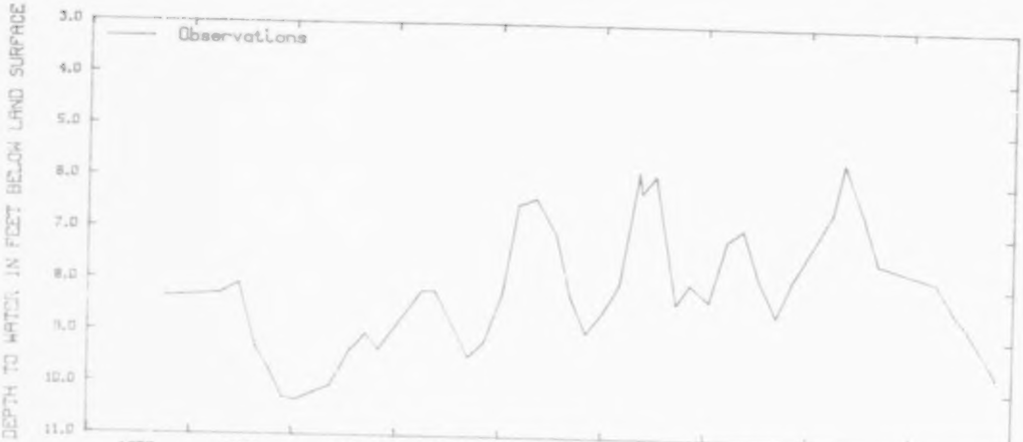
Ground-water levels, 1981-87
Well 113N24W28DAA02

443715093480801. Local number, 113N25W02CAC01.
LOCATION.--Lat 44°37'15", long 93°48'08", in SW¼NE¼SW¼ sec.2, T.113 N., R.25 W., Hydrologic Unit 07020012, 0.75 mi (1.21 km) west of Belle Plaine at Shep's Gravel Pit.
Owner: U.S. Geological Survey.
AQUIFER.--Ironton-Galesville Sandstones of Late Cambrian Age.
WELL CHARACTERISTICS.--Drilled observation artesian well, diameter 4 in. (0.04 m), depth 323 ft (98.4 m), cased to 193 ft (58.8 m).
DATUM.--Altitude of land-surface datum is 750 ft (229 m). Measuring point: Top of casing, 0.25 ft (0.08 m) above land-surface datum.
PERIOD OF RECORD.--October 1979 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 5.59 ft (1.70 m) below land-surface datum, May 7, 1986, lowest, 10.35 ft (3.15 m) below land surface datum, Jan. 8, 1981.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Apr. 2	7.88	June 3	8.43	July 22	8.75

SCOTT COUNTY--Continued

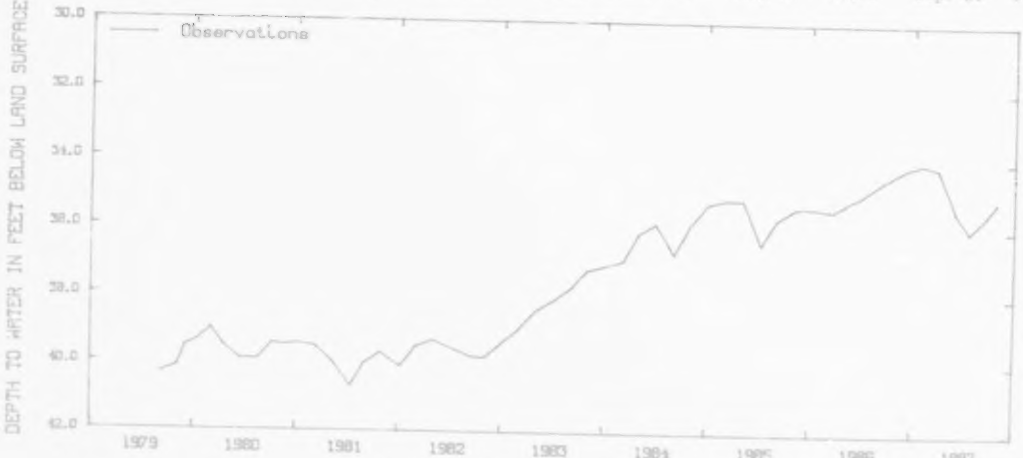


Ground-water levels, 1979-87
Well 113N25W02CAC01

444025093220801. Local number, 114N21W20BAA01.
LOCATION.--Lat 44°40'25", long 93°22'08", in NE¼NE¼NW¼ sec.20, T.114 N., R.21 W., Hydrologic Unit 07020012, 0.5 mi (0.8 km) east of Credit River.
Owner: Credit River Town Hall.
AQUIFER.--Buried sand of Pleistocene Age.
WELL CHARACTERISTICS.--Drilled domestic artesian well, diameter 4 in. (0.10 m), depth 98 ft (29.9 m), screened 93 to 98 ft (28.4 to 29.9 m).
DATUM.--Altitude of land-surface datum is 946 ft (288 m). Measuring point: Top of casing, 1.10 ft (0.34 m) above land-surface datum.
PERIOD OF RECORD.--September 1979 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 34.00 ft (10.36 m) below land-surface datum, Feb. 3, 1987; lowest, 40.72 ft (12.41 m) below land-surface datum, July 16, 1981.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Dec. 4	34.16	Feb. 3	34.00	Apr. 2	34.17	June 4	35.43	July 23	36.03	Sep. 21	35.53



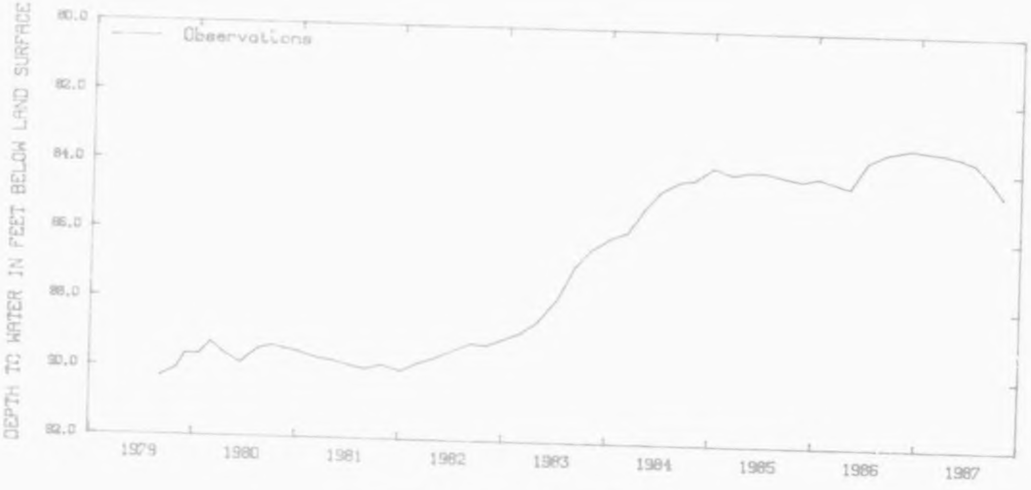
Ground-water levels, 1979-87
Well 114N21W20BAA01

SCOTT COUNTY--Continued

443752093254401. Local number, 114N22W35DCC01.
LOCATION.--Lat 44°37'52", long 93°25'44", in SW¼SW¼SE¼ sec.35, T.114 N., R.22 W., Hydrologic Unit 07020012, southwest of Credit River.
Owner: St. Catherine's Church.
AQUIFER.--Prairie du Chien Group of Early Ordovician Age.
WELL CHARACTERISTICS.--Drilled domestic artesian well, diameter 4 in. (0.10 m), depth 235 ft (71.6 m), cased to 194 ft (59.1 m).
DATUM.--Altitude of land-surface datum is 1,015 ft (309 m). Measuring point: Top of casing, 1.20 ft (0.37 m) above land-surface datum.
PERIOD OF RECORD.--September 1979 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 83.27 ft (25.38 m) below land-surface datum, Dec. 4, 1986; lowest, 90.30 ft (27.52 m) below land-surface datum, Sept. 6, 1979.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Dec. 4	83.27	Feb. 3	83.36	Apr. 2	83.41	June 4	83.53	July 23	83.68	Sep. 21	84.20

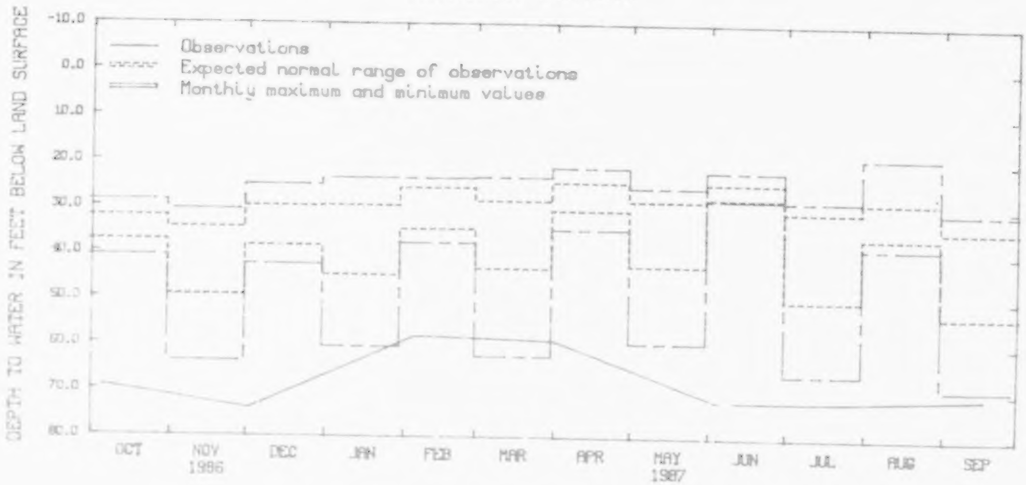


Ground-water levels, 1979-87
Well 114N22W35DCC01

444633093212901. Local number, 115N21W09CCC01.
LOCATION.--Lat 44°46'33", long 93°21'29", in SW¼SW¼SW¼ sec.9, T.115 N., R.21 W., Hydrologic Unit 07020012, at Savage waste treatment plant.
Owner: City of Savage, well 2.
AQUIFER.--Mount Simon Sandstone of Late Cambrian Age and Hinckley Sandstone of Late Precambrian Age.
WELL CHARACTERISTICS.--Drilled public-supply artesian well, depth 846 ft (258 m), 16 in (0.41 m) casing 0 ft to 280 ft (85.3 m), 10 in (0.25 m) casing 250 ft to 660 ft (85.3 m to 201 m).
DATUM.--Land-surface datum is 730 ft (222.5 m). Measuring point: Edge of vent pipe 0.75 ft (0.23 m) above land-surface datum.
PERIOD OF RECORD.--February 1971 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 18.98 ft (5.79 m) below land-surface datum, Aug. 9, 1979; lowest, 74.15 ft (22.60 m) below land-surface datum, Dec. 2, 1986.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Dec. 2	74.15	Feb. 5	58.15	Apr. 1	59.25	June 4	72.29	July 24	71.95	Sep. 17	70.85



Ground-water levels, 1987 water year
Well 115N21W09CCC01

444427093353901. Local number, 115N23W28BDD01.
LOCATION.--Lat 44°44'27", long 93°43'53", in SE¼SE¼NW¼ sec.28, T.115 N., R.23 W., Hydrologic Unit 07020012, Merriam Junction.
Owner: Chicago and Northwestern Transportation Company.
AQUIFER.--Jordan Sandstone of Late Cambrian Age.
WELL CHARACTERISTICS.--Drilled observation artesian well, diameter 16 in. (0.40 m), depth 140 ft (42.7 m), cased to 75 ft (22.9 m).
DATUM.--Altitude of land-surface datum is 758 ft (231 m). Measuring point: Top of casing, 0.90 ft (0.27 m) above land surface datum.
PERIOD OF RECORD.--November 1984 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 25.75 ft (7.84 m) below land-surface datum, Mar. 8, 1985; lowest, 39.62 ft (12.07 m) below land-surface datum, July 22, 1987.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Dec. 2	36.76	Feb. 5	38.08	Apr. 1	38.48	May 27	39.07	July 22	39.62	Sep. 17	38.89

444427093353902. Local number, 115N23W28BDD02.
LOCATION.--Lat 44°44'27", long 93°35'39", in SE¼SE¼NW¼ sec.28, T.115 N., R.23 W., Hydrologic Unit 07020012, Merriam Junction.
Owner: Chicago and Northwestern Transportation Company.
AQUIFER.--Ironton-Galesville Sandstone of Late Cambrian Age.
WELL CHARACTERISTICS.--Drilled observation artesian well, diameter 4 in. (0.10 m), depth 355 ft (108 m), screened 350 to 355 ft (107 to 108 m).
DATUM.--Altitude of land-surface datum is 758 ft (231 m). Measuring point: Top of casing, 1.00 ft (0.30 m) above land-surface datum.
PERIOD OF RECORD.--November 1984 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 20.52 ft (6.25 m) below land-surface datum, Mar. 21, 1986; lowest, 32.80 ft (9.99 m) below land-surface datum, July 9, 1985.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP
5		28.53	23.04	20.82	21.22	21.18	21.11	27.78	28.98		30.24	
10	30.68	25.51	21.98	20.39	21.00	21.25	24.72	26.75	28.96			29.80
15	30.39	23.07	21.43	21.11	21.11	21.18	25.52	28.93	28.59			29.54
20	28.54	22.07	21.34	20.78	21.10	21.20	25.08	29.26	30.60			26.50
25	29.29	22.27	21.10	20.88	21.15	20.93	26.04	26.03	31.69	30.22		29.86
EOM	29.73	21.68	21.01		21.32	20.87	27.90	26.77		29.71		29.86

WTR YEAR 1987 HIGHEST 20.52 JAN. 21, 1987 LOWEST 31.82 JUNE 26, 1987

SCOTT COUNTY--Continued

444427093353903. Local number, 115N23W28BDD03.
LOCATION.--Lat 44°44'27", long 93°35'39", in SE¼SE¼NW¼ sec.28, T.115 N., R.23 W., Hydrologic Unit 07020012, Merriam Junction.
Owner: Chicago and Northwestern Transportation Company.
AQUIFER.--Mount Simon Sandstone of Late Cambrian Age.
WELL CHARACTERISTICS.--Drilled observation artesian well, diameter 4 in. (0.10 m), depth 525 ft (160 m), screened 520 to 525 ft (158 to 160 m).
DATUM.--Altitude of land-surface datum is 758 ft (231 m). Measuring point: Top of casing, 1.00 ft (0.30 m) above land-surface datum.
PERIOD OF RECORD.--November 1984 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 33.85 ft (10.31 m) below land-surface datum, Mar. 8, 1985; lowest, 48.54 ft (14.79 m) below land-surface datum, July 20, 1987.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP
5	40.06	38.56	37.83	36.90	37.08	36.61	36.18	39.50	41.99	46.62	46.94	45.61
10	39.88	38.43	37.76	36.86	37.01	36.80	35.83	39.40	43.07	47.73	46.91	46.02
15	39.36		37.57	37.18	37.14	36.42	36.21	40.63	44.15	47.66	46.58	45.84
20	39.23		37.61	36.99	36.98	36.12	36.95	41.76	46.00	48.54	46.53	45.69
25	39.17		37.44	37.17	36.74	35.91	37.65	41.33	46.53	47.62	46.44	44.94
EOM	39.05		37.11		36.43	35.96	38.62	41.04	46.74	46.93	45.83	44.64

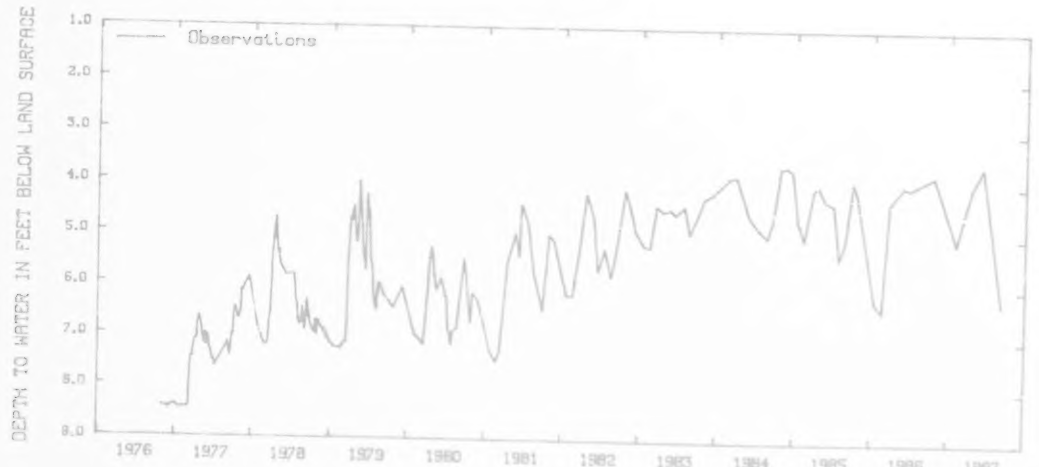
WTR YEAR 1987 HIGHEST 35.66 MAR. 31, 1987 LOWEST 48.54 JULY 20, 1987

SHERBURNE COUNTY

452938093432701. Local number, 035N27W29DBB02.
LOCATION.--Lat 45°29'38", long 93°43'27", in NW¼NW¼SE¼ sec.29, T.35 N., R.27 W., Hydrologic Unit 07010203, 3.2 mi (5.2 km) north of Orrock in Sherburne National Wildlife Refuge.
Owner: U.S. Geological Survey.
AQUIFER.--Surficial sand and gravel of Pleistocene Age.
WELL CHARACTERISTICS.--Bored observation water-table well, diameter 2¼ in. (0.05 m), depth 15 ft (4.6 m), screened 13 to 15 ft (4.0 to 4.6 m).
DATUM.--Land-surface datum is 987.1 ft (300.9 m) National Geodetic Datum of 1929. Measuring point: Top of casing, 1.70 ft (0.52 m) above land-surface datum.
PERIOD OF RECORD.--October 1976 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 3.60 ft (1.09 m) below land-surface datum, June 9, 1987; lowest, 8.48 ft (2.58 m) below land-surface datum, Nov. 30, 1976.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct. 20	3.78	Feb. 6	5.10	Mar. 24	4.38	Apr. 21	3.98	June 9	3.60	Sep. 11	6.26
Dec. 18	4.49										



Ground-water levels, 1976-87,
Well 035N27W29DBB02

STEELE COUNTY

435742093164001. Local number, 106N20W30BAD01.
LOCATION.--Lat 43°57'42", long 93°16'40", in SE¼NE¼NW¼ sec 30, T.106 N., R.20 W., Hydrologic Unit 07040002, at Hope.
Owner: Hope Elevator.
AQUIFER.--Galena Formation of Middle Ordovician Age.
WELL CHARACTERISTICS.--Drilled commerical artesian well, diameter 5 in. (0.13 m), depth 215 ft (65.5 m), cased to 108 ft (32.9 m).
DATUM.--Altitude of land-surface datum is 1,198 ft (365 m). Measuring point: Top of casing, 1.00 ft (0.30 m) above land-surface datum.
PERIOD OF RECORD.--November 1981 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 29.90 ft (9.11 m) below land-surface datum, May 10, 1984; lowest, 34.48 ft (10.50 m) below land-surface datum, July 10, 1985.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

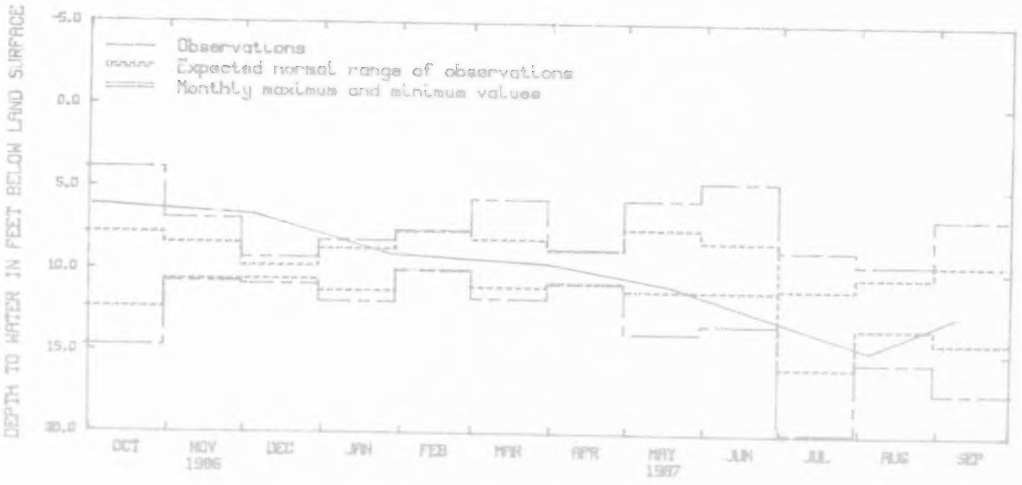
DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Dec. 8	31.80	Feb. 12	33.30	Apr. 14	32.62	June 2	33.67	July 21	33.52	Sep. 22	33.22

SWIFT COUNTY

451913095370201. Local number, 121N39W06BDB01.
LOCATION.--Lat 45°19'13", long 95°37'02", in NW¼SE¼NW¼ sec.6, T.121 N., R.39 W., Hydrologic Unit 07020005, in Ambush Park.
Owner: City of Benson.
AQUIFER.--Buried sand of Pleistocene Age.
WELL CHARACTERISTICS.--Drilled observation artesian well, diameter 3 in. (0.08 m), depth 143 ft (43.6 m), screened 123 to 143 ft (37.5 to 43.6 m).
DATUM.--Altitude of land-surface datum is 1,030 ft (314 m). Measuring point: Top of casing 3.00 ft (0.91 m) above land-surface datum.
REMARKS.--Water level affected by pumping.
PERIOD OF RECORD.--May 1979 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 3.85 ft (1.17 m) below land-surface datum, Oct. 25, 1984; lowest, 19.90 ft (6.07 m) below land-surface datum, July 24, 1980.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct. 2 Dec. 5	6.12 6.71	Jan. 28	9.08	Mar. 31	9.63	May 19	11.00	Aug. 5	14.85	Sep. 8	12.69



Ground-water levels, 1987 water year
Well 121N39W06BDB01

WABASHA COUNTY

442708092155401. Local number, 111N12W04BBD01.

LOCATION.--Lat 44°27'08", long 92°15'54", in SE¼NW¼NW¼ sec.04, T.111 N., R.12 W., Hydrologic Unit 07040001, at Lake City.

Owner: City of Lake City, well 3.

AQUIFER.--Mount Simon Sandstone of Late Cambrian Age.

WELL CHARACTERISTICS.--Drilled unused artesian well, diameter 16 in. (0.41 m), depth 430 ft (131 m), cased to 258 ft (78.6 m).

DATUM.--Altitude of land-surface datum is 685 ft (209 m). Measuring point: Top of casing, 1.00 ft (0.30 m) above land-surface datum.

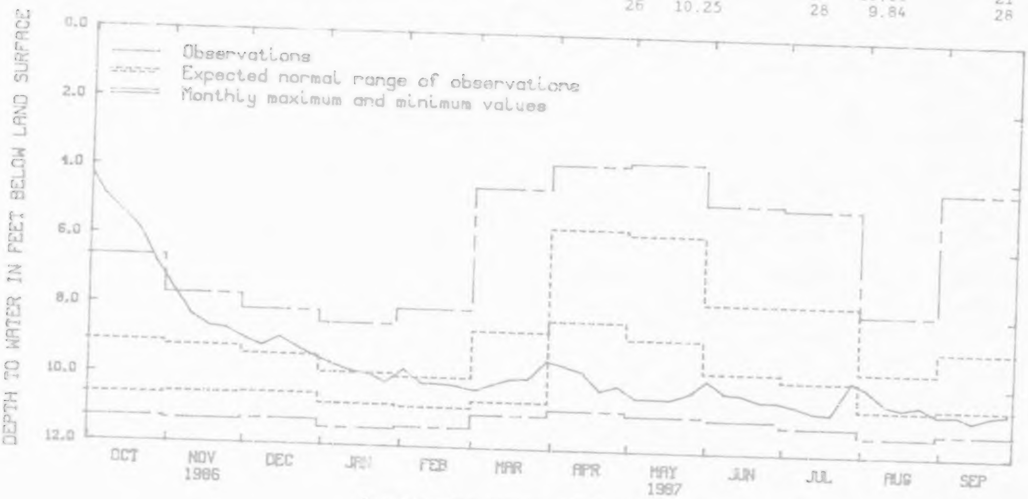
REMARKS.--Measured weekly by David Finley.

PERIOD OF RECORD.--August 1974 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level, 3.63 ft (1.11 m) below land-surface datum, May 5, 1975; lowest, 11.50 ft (3.51 m) below land-surface datum, Jan. 31, 1977.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct. 6	4.88	Dec. 8	9.18	Feb. 2	9.75	Mar. 30	9.43	June 1	9.89	Aug. 3	10.06
20	5.86	15	8.90	9	10.17	Apr. 6	9.58	8	10.27	10	10.49
27	6.82	22	9.21	17	10.18	13	9.74	15	10.31	17	10.62
Nov. 3	7.58	29	9.46	23	10.23	20	10.27	22	10.49	24	10.50
10	8.32	Jan. 5	9.67	Mar. 2	10.34	27	10.11	29	10.49	31	10.79
17	8.64	12	9.85	9	10.14	May 4	10.48	July 6	10.61	Sep. 8	10.74
24	8.71	20	9.94	16	9.97	11	10.45	13	10.78	14	10.94
Dec. 1	8.97	26	10.17	23	9.95	18	10.48	20	10.81	21	10.75
						26	10.25	28	9.84	28	10.68



Ground-water levels, 1987 water year
Well 111N12W04BBD01

WADENA COUNTY

462415095003001. Local number, 134N34W19ADD01.

LOCATION.--Lat 46°24'21", long 95°00'36", in SE¼SE¼NE¼ sec.19, T.134 N., R.34 W., Hydrologic Unit 07010107, 0.05 mi (0.08 km) north of Verndale.

Owner: U.S. Geological Survey.

AQUIFER.--Surficial outwash sand and gravel of Pleistocene Age.

WELL CHARACTERISTICS.--Bored observation water-table well, diameter 2 in. (0.05 m), depth 37 ft (11.3 m), screened 34 to 37 ft (10.4 to 11.3 m).

DATUM.--Altitude of land-surface datum is 1,342 ft (409 m). Measuring point: Top of casing, 1.00 ft (0.30 m) above land-surface datum.

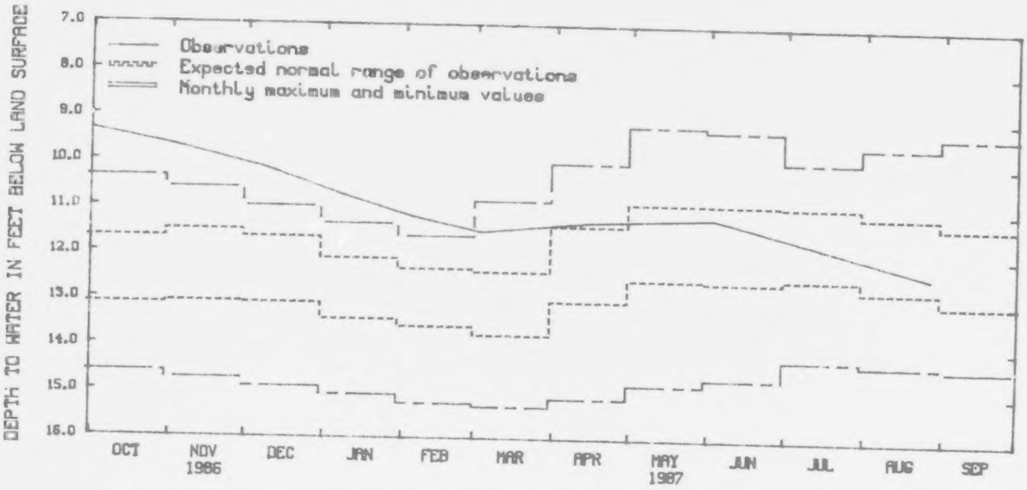
PERIOD OF RECORD.--September 1966 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level, 9.18 ft (2.79 m) below land-surface datum, May 23, 1986; lowest, 15.33 ft (4.41 m) below land-surface datum, Mar. 10-11, 1977.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DAY	WATER LEVEL	DAY	WATER LEVEL	DAY	WATER LEVEL	DAY	WATER LEVEL	DAY	WATER LEVEL	DAY	WATER LEVEL
Nov. 3	9.70	Jan. 7	10.73	Mar. 3	11.53	June 3	11.19	July 15	11.80	Aug. 27	12.42
Dec. 9	10.18	Feb. 4	11.20	Apr. 14	11.29						

WADENA COUNTY--Continued



Ground-water levels, 1987 water year
Well 134N34W19ADD01

WASHINGTON COUNTY

445125092464001. Local number, 027N20W02BCC01.
LOCATION.--Lat 44°51'25", long 92°46'40", in SW¼SW¼NW¼ sec.2, T.27 N., R.20 W., Hydrologic Unit 07030005, in Afton State Park by Afton Alps.
Owner: U.S. Geological Survey.
AQUIFER.--St. Lawrence Formation and Franconian Sandstone of Late Cambrian Age.
WELL CHARACTERISTICS.--Drilled observation artesian well, diameter 6 in. (0.15 m), depth 285 ft (86.9 m), cased to 105 ft (32.0 m).
DATUM.--Altitude of land-surface datum is 695 ft (212 m). Measuring point: Center of pressure guage, 3.80 ft (1.16 m) above land-surface datum.
PERIOD OF RECORD.--March 1980 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 33.94 ft (10.38 m) above land-surface datum, May 2, 1980; lowest, 19.67 ft (5.991 m) above land-surface datum, Jan.8, 1985.

WATER LEVEL, IN FEET ABOVE LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct. 28	-29.56	Feb. 13	-23.58	Apr. 10	-29.21	June 1	-29.21	July 30	-29.33	Sep. 15	-28.87

445125092464002. Local number, 027N20W02BCC02.
LOCATION.--Lat 44°51'25", long 92°46'40", in SW¼SW¼NW¼ sec.2, T.27 N., R.20 W., Hydrologic Unit 07030005, in Afton State Park by Afton Alps.
Owner: U.S. Geological Survey.
AQUIFER.--Ironton-Galesville Sandstones of Late Cambrian Age.
WELL CHARACTERISTICS.--Drilled observation artesian well, diameter 4 in. (0.10 m), depth 385 ft (117 m), cased to 365 ft (111 m).
DATUM.--Altitude of land-surface datum is 695 ft (212 m). Measuring point: Center of pressure guage, 3.80 ft (1.16 m) above land-surface datum.
PERIOD OF RECORD.--March 1980 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 42.35 ft (12.91 m) above land-surface datum, May 2, 1980; lowest, 23.81 ft (7.25 m) above land-surface datum, Jan. 8, 1985.

WATER LEVEL, IN FEET ABOVE LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct. 28	-35.77	Feb. 13	-28.64	Apr. 10	-35.19	June 1	-35.31	July 30	-35.77	Sep. 15	-35.31

WASHINGTON COUNTY--Continued

445125092464003. Local number, 027N20W02BCC03.
LOCATION.--Lat 44°51'25", long 92°46'40", in SW¼SW¼NW¼ sec.2, T.27 N., R.20 W., Hydrologic Unit 07030005, in Afton State Park by Afton Alps.
Owner: U.S. Geological Survey.
AQUIFER.--Mount Simon Sandstone of Late Cambrian Age.
WELL CHARACTERISTICS.--Drilled observation artesian well, diameter 1¼ in. (0.04 m), depth 535 ft (163 m), screened 530 to 535 ft (162 to 163 m).
DATUM.--Altitude of land-surface datum is 695 ft (212 m). Measuring point: Center of pressure guage, 3.40 ft (1.04 m) above land-surface datum.
PERIOD OF RECORD.--March 1980 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 22.05 ft (6.72 m) above land-surface datum, May 2, 1980; lowest, 6.62 ft (2.01 m) above land-surface datum, Aug. 16, 1985.

WATER LEVEL, IN FEET ABOVE LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct. 28	-10.53	Feb. 13	-9.38	Apr. 10	-9.72	June 1	-8.23	July 30	-7.54	Sep. 15	-9.61

444751092563101. Local number, 027N21W28BCC01.
LOCATION.--Lat 44°47'51", 92°56'31", in SW¼SW¼NW¼ sec.28, T.27 N., R.21 W., Hydrologic Unit 07010206, 0.1 mi (0.2 km) east of Ideal Avenue South.
Owner: Eugene Smallidge.
AQUIFER.--Prairie du Chien Group of Early Ordovician Age and Jordan Sandstone of Late Cambrian Age.
WELL CHARACTERISTICS.--Drilled irrigation water-table well, diameter 16 in. (0.41 m), depth 345 ft (105 m), cased to 60 ft (18.3 m).
DATUM.--Altitude of land surface datum is 807 ft (246 m). Measuring point: Hole in pump base, 2.10 ft (0.64 m) above land-surface datum.
PERIOD OF RECORD.--August 1977, January 1978, December 1979 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 60.32 ft (18.38 m) below land-surface datum, Oct. 28, 1986; lowest, 81.87 ft (24.95 m) below land-surface datum, Aug. 3, 1977.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

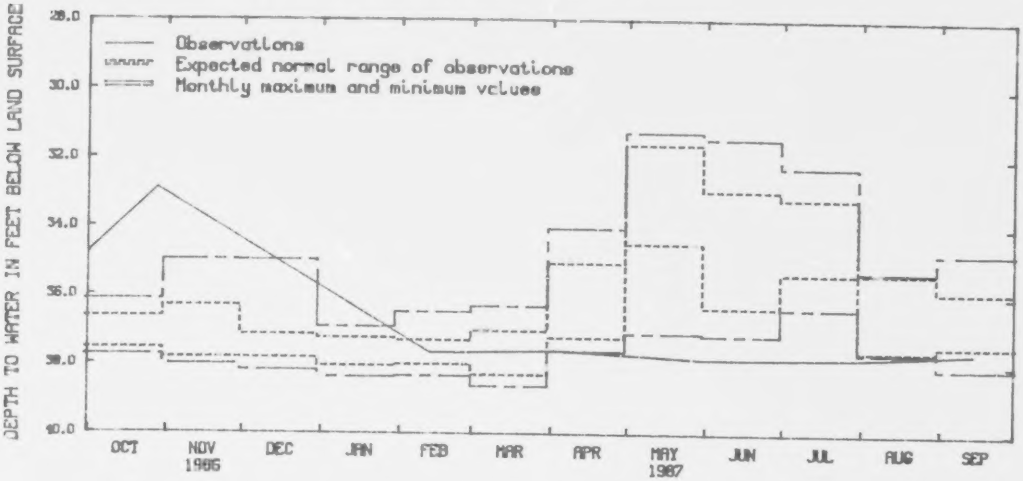
DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct. 28	60.32	Feb. 3	62.04	Mar. 31	63.58	May 28	66.26	July 23	59.63	Sep. 15	64.83

445536092462401. Local number, 028N20W11CAA01.
LOCATION.--Lat 44°55'36", long 92°46'24", in NE¼NE¼SW¼ sec.11, T.28 N., R.20 W., Hydrologic Unit 07030005, at Lake St. Croix Beach.
Owner: Lower St. Croix Valley Fire Department.
AQUIFER.--Franconian Sandstone of Late Cambrian Age.
WELL CHARACTERISTICS.--Drilled domestic water-table well, diameter 4 in. (0.10 m), depth 94 ft (28.6 m), cased to 78 ft (23.8 m).
DATUM.--Altitude of land-surface datum is 720 ft (220 m). Measuring point: Top of electrical housing, 1.70 ft (0.52 m) above land-surface datum.
PERIOD OF RECORD.--June 1978 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 31.27 ft (9.53 m) below lend-surface datum, May 1, 1986; lowest, 38.65 ft (11.78 m) below land-surface datum, Mar. 3, 1982.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct. 28	32.89	Feb. 13	37.70	Apr. 3	37.60	June 1	37.86	July 30	37.79	Sep. 14	37.62

WASHINGTON COUNTY--Continued

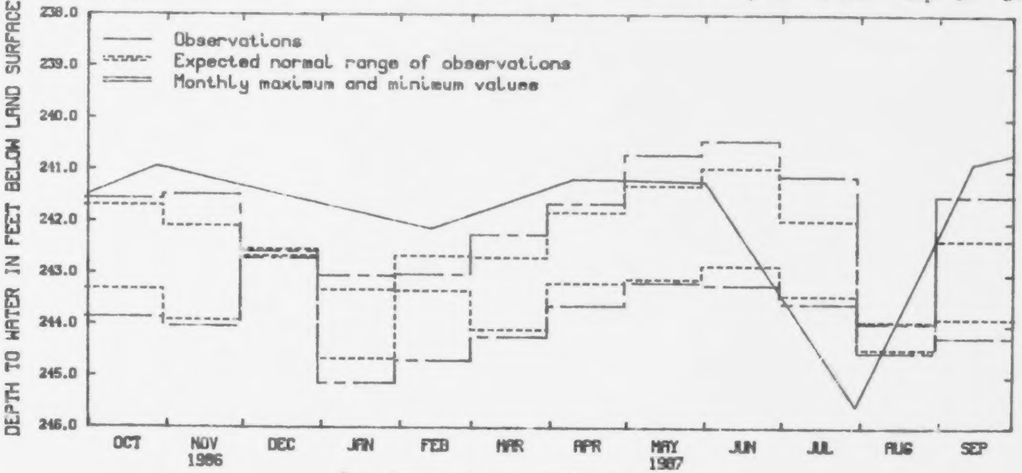


Ground-water levels, 1987 water year
Well 028N20W11CAA01

445220092465901. Local number, 028N20W34ADA01.
LOCATION.--Lat 44°52'20", long 92°46'59", in NE¼SE¼NE¼ sec.34, T.28 N., R.20 W., Hydrologic Unit 07030005, in Afton State Park.
Owner: State of Minnesota.
AQUIFER.--Franconia Sandstone of Late Cambrian Age.
WELL CHARACTERISTICS.--Drilled unused artesian well, diameter 4 in. (0.10 m), depth 306 ft (93.2 m), cased to 276 ft (84.1 m).
DATUM.--Altitude of land-surface datum is 970 ft (296 m). Measuring point: Top of casing, 0.90 ft (0.27 m) above land-surface datum.
PERIOD OF RECORD.--August 1979 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 240.43 ft (73.28 m) below land-surface datum, June 27, 1984; lowest, 245.59 ft (74.85 m) below land-surface datum, July 30, 1987.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct. 28	240.93	Feb. 13	242.14	Apr. 10	241.17	June 1	241.24	July 30	245.59	Sep. 14	240.86



Ground-water levels, 1987 water year

Well 028N20W34ADA01

WASHINGTON COUNTY--Continued

450134092583101. Local number, 029N21W06CAD01.

LOCATION.--Lat 45°01'34", long 92°58'31", in SE¼NE¼SW¼ sec.6, T.29 N., R.21 W., Hydrologic Unit 07010206, at 6488 North Highway 36 Boulevard.

Owner: Twenty Nine Pines Trailer Park.

AQUIFER.--St. Peter Sandstone of Middle Ordovician Age.

WELL CHARACTERISTICS.--Drilled unused artesian well, diameter 6 in (0.15 m), depth 210 ft (64.0 m), cased to 141 ft (43.0 m).

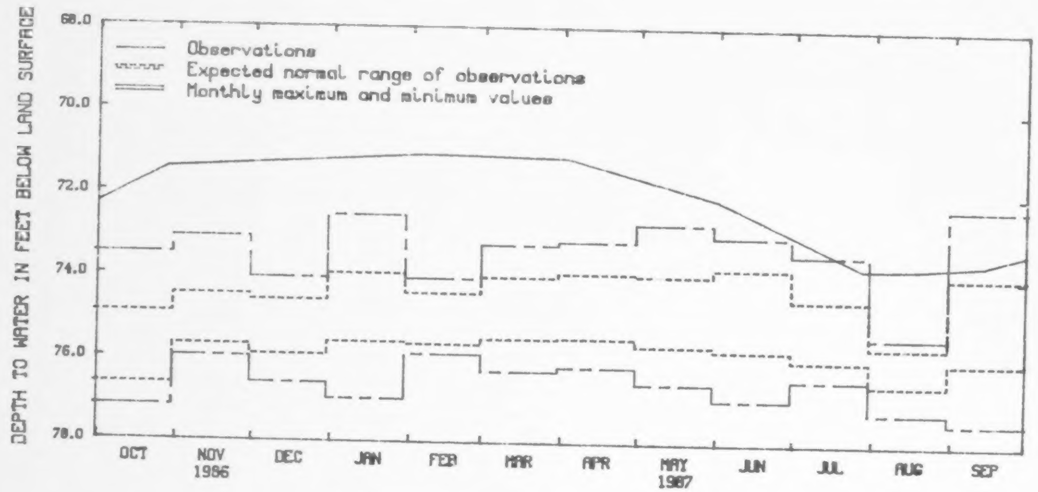
DATUM.--Altitude of land-surface datum is 980 ft (299 m). Measuring point: Hole in pump base, 2.20 ft (0.67 m) above land-surface datum.

PERIOD OF RECORD.--April 1974 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level, 71.07 ft (21.66 m) below land-surface datum, Feb. 6, 1987; lowest, 77.47 ft (23.61 m) below land-surface datum, Sept. 13, 1977.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct. 28 Feb. 6	71.43 71.07	Apr. 3	71.16	June 1	72.14	July 28	73.77	Aug. 19	73.72	Sep. 14	73.60



Ground-water levels, 1987 water year
Well 029N21W06CAD01

450027092552101. Local number, 029N21W10CCC01.

LOCATION.--Lat 45°00'27", long 95°55'21", in SW¼SW¼SW¼ sec.10, T.29 N., R.21 W., Hydrologic Unit 07010206, Lake Jane Road, 0.7 mi (1.1 km) north of Highway 212.

Owner: City of Lake Elmo.

AQUIFER.--Jordan Sandstone of Late Cambrian Age.

WELL CHARACTERISTICS.--Drilled unused artesian well, diameter 6 in. (0.15 m), depth 348 ft (106 m), cased to 280 ft (85.3 m).

DATUM.--Altitude of land-surface datum is 935 ft (285 m). Measuring point: Top of well cap, 1.20 ft (0.37 m) above land-surface datum.

PERIOD OF RECORD.--September 1977, February 1978, February 1980 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level, 31.92 ft (9.72 m) below land-surface datum, Oct. 28, 1986; lowest, 45.65 ft (13.91 m) below land-surface datum, Sept. 28, 1977.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

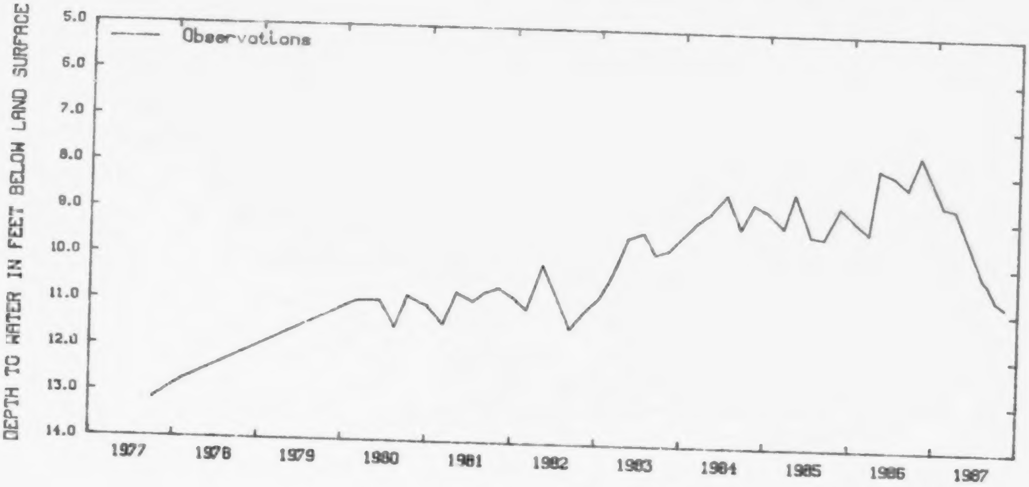
DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct. 28 Feb. 6	31.92 32.29	Apr. 3	32.92	June 1	33.78	July 30	34.84	Aug. 19	35.16	Sep. 14	35.41

WASHINGTON COUNTY--Continued

450858092575001. Local number, 031N21W28ABD01.
LOCATION.--Lat 45°08'58", long 92°57'50", in SE¼NW¼NE¼ sec.28, T.31 N., R.21 W., Hydrologic Unit 07010206, County Road 8A, 1.65 mi (2.6 km) east of Highway 61.
Owner: White Bear Gun Club.
AQUIFER.--Prairie du Chien Group of Early Ordovician Age.
WELL CHARACTERISTICS.--Drilled domestic artesian well, diameter 4 in. (0.10 m), depth 142 ft (43.3 m), cased to 94 ft (28.6 m).
DATUM.--Altitude of land-surface datum is 939 ft (28.6 m). Measuring point: Top of well cap, 1.30 ft (0.40 m) above land-surface datum.
PERIOD OF RECORD.--September 1977, February 1978, February 1980 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 7.57 ft (2.30 m) below land-surface datum, Oct. 28, 1986; lowest, 13.17 ft (4.01 m) below land-surface datum, Sept. 30, 1987.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct. 28	7.57	Feb. 4	8.66	Mar. 30	8.73	July 28	10.20	Aug. 19	10.32	Sep. 24	10.68



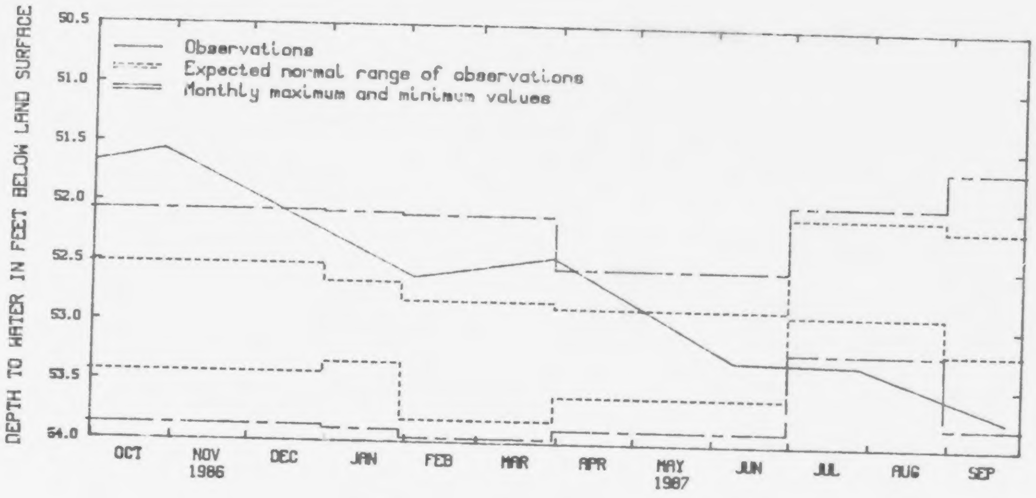
Ground-water levels, 1977-87
Well 031N21W28ABD01

451355092532601. Local number, 032N20W30BCD01.
LOCATION.--Lat 45°13'55", long 92°53'26", in SE¼SW¼NW¼ sec.30, T.32 N., R.20 W., Hydrologic Unit 07030005, 0.25 mi (0.4 km) north of 192nd Street.
Owner: Arno Birr.
AQUIFER.--Prairie du Chien Group of Early Ordovician Age and Jordan Sandstone of Late Cambrian Age.
WELL CHARACTERISTICS.--Drilled irrigation artesian well, diameter 12 in. (0.30 m), depth 260 ft (79.2 m), cased to 141 ft (43.0 m).
DATUM.--Altitude of land-surface datum is 990 ft (302 m). Measuring point: Vent pipe, 1.00 ft (0.30 m) above land-surface datum.
PERIOD OF RECORD.--March 1981 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 51.67 ft (15.74 m) below land-surface datum, Sept. 3, 1986; lowest, 53.97 ft (16.43 m) below land-surface datum, Mar. 9, 1983.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct. 26	51.56	Feb. 4	52.62	Mar. 30	52.44	June 9	53.30	July 28	53.32	Sep. 24	53.77

WASHINGTON COUNTY--Continued



Ground-water levels, 1987 water year
Well 032N20W30BCD01

WATONWAN COUNTY

440037094372601. Local number, 106N32W01DDB01.

LOCATION.--Lat 44°00'37", long 94°37'26", in NW¼SE¼SE¼ sec.1, T.106 N., R.32 W., Hydrologic Unit 07020010, north of St. James.

Owner: U.S. Geological Survey.

AQUIFER.--Surficial outwash sand and gravel of Pleistocene Age.

WELL CHARACTERISTICS.--Bored observation water-table well, diameter 2 in. (0.05 m), depth 22 ft (6.7 m), screened 19 to 22 ft (5.8 to 6.7 m).

DATUM.--Altitude of land-surface datum is 1,056.2 ft (321.9 m) National Geodetic Vertical Datum of 1929. Measuring point: Top of casing, 4.80 ft (1.46 m) above land-surface datum.

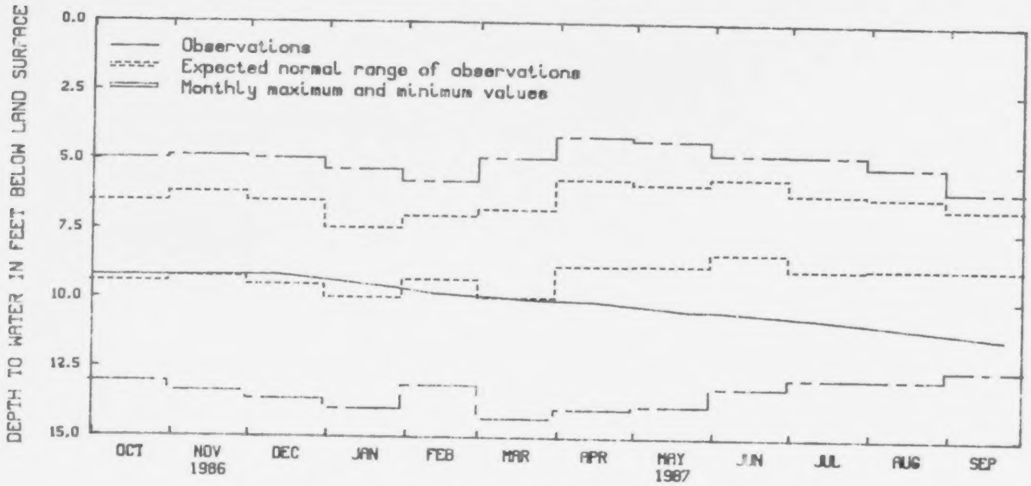
PERIOD OF RECORD.--November 1965 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level, 4.11 ft (1.25 m) below land-surface datum, Apr. 27, 1969; lowest, 14.34 ft (4.37 m) below land-surface datum, Mar. 1, 1977.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Dec. 9	9.16	Jan. 29	9.64	Mar. 24	10.05	May 22	10.42	July 14	10.71	Aug. 27	11.11
Dec. 11	9.15	Feb. 11	9.83	Apr. 15	10.09	June 3	10.42	July 22	10.78	Sep. 23	11.37

WATONWAN COUNTY--Continued



Ground-water levels, 1987 water year
Well 106N32W01DDB01

440409094304901. Local number, 107N31W14DAC01.

LOCATION.--Lat 44°04'09", long 94°30'49", in SW¼NE¼SE¼ sec.14, T.107 N., R.31 W., Hydrologic Unit 07020010, 2.75 mi (4.4 km) east of LaSalle.

Owner: William Lassas.

AQUIFER.--Sandstone of Cretaceous Age.

WELL CHARACTERISTICS.--Drilled irrigation artesian well, diameter 12 in. (0.30 m), depth 150 ft (45.7 m), screened 100 to 135 ft (30.5 to 41.2 m).

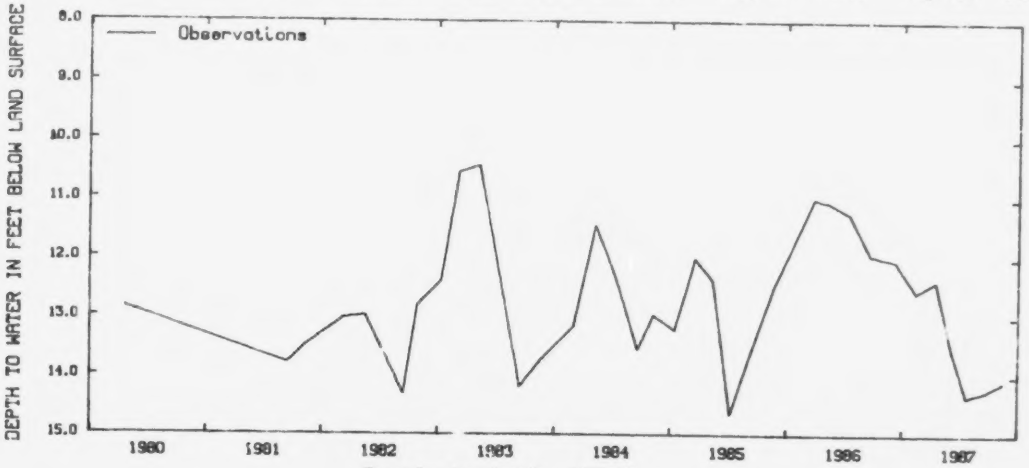
DATUM.--Altitude of land-surface datum is 1,008 ft (307 m). Measuring point: Vent pipe, 1.80 ft (0.55 m) above land-surface datum.

PERIOD OF RECORD.--September 1981 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level, 10.44 ft (3.18 m) below land-surface datum, May 3, 1983; lowest, 14.65 ft (4.36 m) below land-surface datum, July 9, 1985.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Dec. 9	12.05	Feb. 11	12.58	Apr. 15	12.38	June 3	13.52	July 22	14.35	Sep. 23	14.24



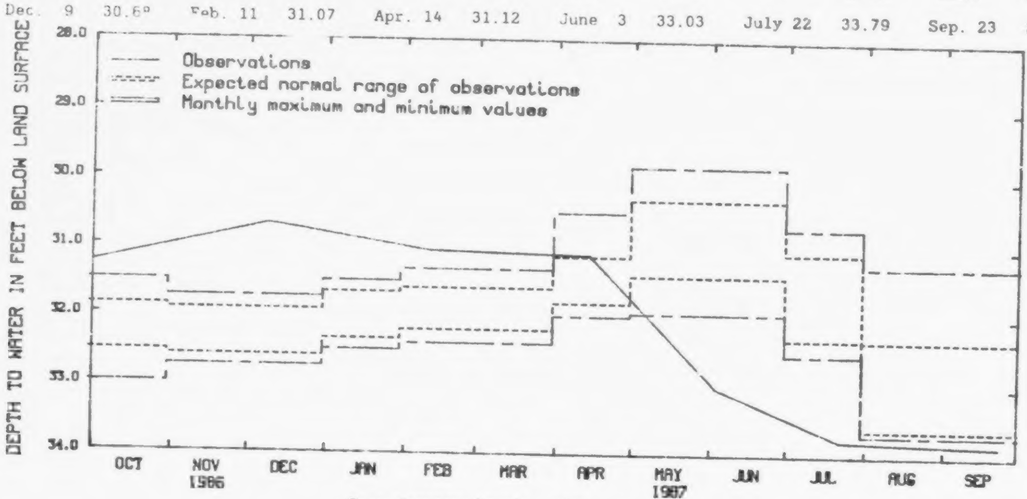
Ground-water levels, 1980-87
Well 107N31W14DAC01

WATONWAN COUNTY--Continued

440133094312501. Local number, 107N31W35CAC01.
LOCATION.--Lat 44°01'33", long 94°31'25", in SW¼NE¼SW¼ sec.35, T.107 N., R.31 W., Hydrologic Unit 07020010, northeast of St. James.
Owner: Al Guyer.
AQUIFER.--Mount Simon Sandstone of Late Cambrian Age.
WELL CHARACTERISTICS.--Drilled irrigation artesian well, diameter 10 in. (0.25 m), depth 350 ft (107 m), screened 310 to 350 ft (94.5 to 107 m).
DATUM.--Altitude of land-surface datum is 1,055 ft (322 m). Measuring point: Vent pipe, 1.00 ft (0.30 m) above land-surface datum.
PERIOD OF RECORD.--September 1981 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 29.83 ft (9.09 m) below land-surface datum, May 9, 1983; lowest, 33.85 ft (10.31 m) below land-surface datum, Sept. 23, 1987

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Dec. 9	30.69	Feb. 11	31.07	Apr. 14	31.12	June 3	33.03	July 22	33.79	Sep. 23	33.85



Ground-water levels, 1987 water year
Well 107N31W35CAC01

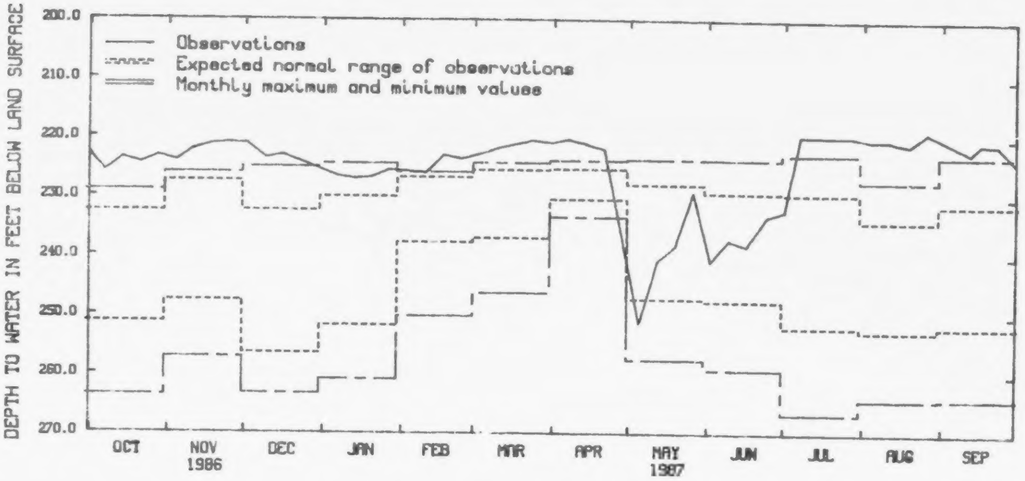
WINONA COUNTY

435746092034202. Local number, 106N10W19DDA02.
LOCATION.--Lat 43°57'46", long 92°03'42", in NE¼SE¼SE¼ sec. 19, T.106N., R.10W., Hydrologic Unit 07040003, at St. Charles.
Owner: City of St. Charles, Well 5.
AQUIFER.--Ironton-Galesville Sandstones of Late Cambrian Age.
WELL CHARACTERISTICS.--Drilled public supply artesian well, diameter 12 in. (0.30 m), depth 702 ft (214 m), cased to 645 ft (197 m).
DATUM.--Altitude of land-surface datum is 1,160 ft (354 m); Measuring point: Edge of vent pipe, 1.00 ft (0.30 m) above land-surface datum.
REMARKS.--Water level affected by pumping.
PERIOD OF RECORD.--May 1984 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 218.80 ft (66.69 m) below land-surface datum, Aug. 26, 1987; lowest, 266.75 ft (81.30 m) below land-surface datum, July 20, 1985.

WATER LEVEL, IN FEET BELOW LAND SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct. 7	225.90	Dec. 2	221.22	Feb. 10	226.10	Apr. 7	220.20	June 2	240.90	Aug. 4	220.40
14	223.60	9	223.62	17	223.00	14	221.10	9	237.20	11	220.30
21	224.60	16	223.00	24	223.70	21	222.00	16	238.30	19	221.10
28	223.20	Jan. 6	226.60	Mar. 3	222.80	May 5	251.40	24	233.20	26	218.80
Nov. 4	224.20	13	227.10	10	221.80	12	240.80	July 1	232.20	Sep. 12	222.40
10	222.20	20	226.70	24	220.38	19	238.20	7	219.55	16	220.70
18	221.20	27	225.40	31	220.90	26	229.20	28	219.75	23	220.90
25	220.90									30	224.10

WINONA COUNTY--Continued



Ground-water levels, 1987 water year
Well 106N10W19DDA02

WRIGHT COUNTY

450318094040603. Local number, 118N27W03CAC03.

LOCATION.--Lat 45°03'18", long 94°04'06", in SW¼NE¼SW¼ sec.3, T.118 N., R.27 W., Hydrologic Unit 07010204, at Howard Lake water tower.

Owner: City of Howard Lake, well 3.

AQUIFER.--Buried sand and gravel of Pleistocene Age.

WELL CHARACTERISTICS.--Drilled public-supply artesian well, diameter 12 in. (0.30 m), depth 148 ft (45.1 m), screened 138 to 148 ft (42.1 to 45.1 m).

DATUM.--Altitude of land-surface datum is 1,045 ft (319 m). Measuring point: Top of breather pipe, 1.80 ft (0.55 m) above land-surface datum.

PERIOD OF RECORD.--September 1976 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level, 62.78 ft (19.14 m) below land-surface datum, May 29, 1979; lowest, 72.19 ft (22.00 m) below land-surface datum, June 24, 1977.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct. 8	65.64	Jan. 12	66.30	Mar. 9	67.00	May 12	67.61	Aug. 11	68.15	Sep. 9	68.12

450403093544501. Local number, 119N26W35DDA01.

LOCATION.--Lat 45°04'03", long 93°54'45", in NE¼SE¼SE¼ sec.35, T.119 N., R.26 W., Hydrologic Unit 07010204, at Montrose.

Owner: City of Montrose, well 1.

AQUIFER.--Mount Simon Sandstone of Late Cambrian Age and Hinckley Sandstone of Late Precambrian Age.

WELL CHARACTERISTICS.--Drilled unused artesian well, diameter 10 in. (0.25 m), depth 693 ft (211 m), cased to 526 ft (160 m).

DATUM.--Altitude of land-surface datum is 1,000 ft (305 m). Measuring point: Edge of breather pipe, 1.50 ft (0.46 m) above land-surface datum.

PERIOD OF RECORD.--September 1976 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level, 73.54 ft (22.41 m) below land-surface datum, Sept. 28, 1981; lowest, 78.38 ft (23.89 m) below land-surface datum, Nov. 3, 1977.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct. 8	74.00	Jan. 12	74.22	Mar. 9	74.79	May 12	74.95	Aug. 11	75.15	Sep. 9	75.35

YELLOW MEDICINE COUNTY

444219096165501. Local number, 114N45W04DCD01.

LOCATION.--Lat 44°42'19", long 96°16'55", in SE¼SW¼SE¼ sec.4, T.114 N., R.45 W., Hydrologic Unit 07020003, at Canby City Park.

Owner: City of Canby, well 6.

AQUIFER.--Surficial sand and gravel of Pleistocene Age.

WELL CHARACTERISTICS.--Drilled unused water-table well, diameter 12 in. (0.30 m), depth 62 ft (18.9 m), screened 44 to 68 ft (13.4 to 20.7 m).

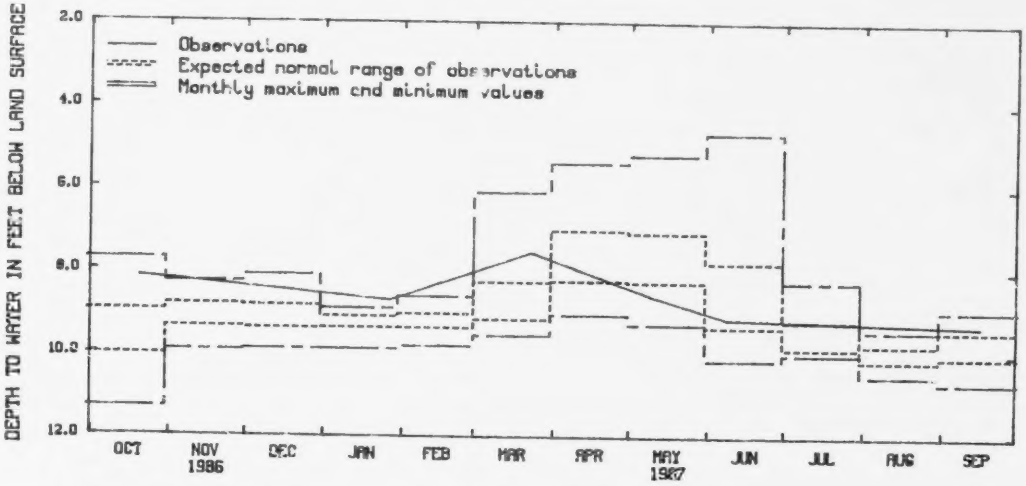
DATUM.--Altitude of land-surface datum is 1,255 ft (382 m). Measuring point: Top of casing, 2.90 ft (0.88 m) above land-surface datum.

PERIOD OF RECORD.--January 1964 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level, 4.67 ft (1.42 m) below land-surface datum, June 5, 1965; lowest, 11.32 ft (3.45 m) below land-surface datum, Oct. 7, 1976.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct. 20	8.17	Jan. 27	8.73	Mar. 23	7.55	May 8	8.58	June 8	9.16	Sep. 16	9.32



Ground-water levels, 1987 water year
Well 114N45W04DCD01

QUALITY OF GROUND WATER

WATER QUALITY DATA, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

ANOKA COUNTY

STATION NUMBER	LOCAL IDENTIFIER	GEO-LOGIC UNIT	DATE	TIME	DEPTH BELOW LAND SURFACE (WATER LEVEL) (FEET) (72019)	DEPTH OF WELL, TOTAL (FEET) (72008)	ELEV. OF LAND SURFACE DATUM (FT. ABOVE NGVD) (72000)	SPE-CIFIC CON-DUCT-ANCE (US/CM) (00095)	SPE-CIFIC CON-DUCT-ANCE LAB (US/CM) (90095)
450303093161707	030N24W27DCC01 MWW4 AT MPLS	112PLSC	08-07-87	1145	29.24	55	830	1410	1460
450313093165401	030N24W27CDA01 MWW12 AT ANO	112PLSC	08-06-87	1330	25.20	60	930	1220	1220
450345093165401	030N24W27BAC01 MWW3 AT ANOK	112PLSC	08-06-87	1500	25.56	39	835	1150	1200
450403093164901	030N24W22CDA01 MWW1 AT ANOK	112PLSC	08-06-87	1100	13.21	54	816	585	618
451441093271701	032N25W21DAC01	112OTSH	05-14-87	1130	2.26	7	867	140	143
451441093271702	032N25W21DAC02PETERSON_D(A2	112OTSH	05-14-87	1230	2.27	22	867	398	395
451442093193201	032N24W22CBC01SLYZUK_S(A1)	112OTSH	05-14-87	1000	14.78	20	891	350	357
451534093263401	032N25W15CAC01	112OTSH	05-14-87	1330	9.75	14	881	420	414
451534093263402	032N25W15CAC02	112OTSH	05-14-87	1430	9.73	29	881	509	[illegible]
451651093035001	032N22W10AAC01 THURNBECK,DA	112OTSH	05-19-87	1430	5.95	10	912	372	[illegible]
452132093045301	033N22W10CCB01BROADBENT_FLD	112OTSH	05-19-87	1100	9.25	13	909	300	299
452132093045302	033N22W10CCB02BROADBENT_FLD	112OTSH	05-19-87	1200	9.25	28	909	291	293
452153093050201	033N22W09ADB01BROADBENT_S(A	112OTSH	05-15-87	1630	11.32	15	909	154	139
452156093050405	033N22W09ADB05 BROADBENT-SH	112OTSH	05-15-87	1430	6.94	10	903	2900	2890
452156093050406	033N22W09ADB06 BROADBENT SH	112OTSH	05-15-87	1500	7.02	--	903	1180	1560

DATE	PH (STAND-ARD UNITS) (00400)	PH LAB (STAND-ARD UNITS) (00403)	TEMPER-ATURE WATER (DEG C) (00010)	CALCIUM DIS-SOLVED (MG/L AS CA) (00915)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG) (00925)	SODIUM, DIS-SOLVED (MG/L AS NA) (00930)	POTAS-SIUM, DIS-SOLVED (MG/L AS K) (00935)	ALKA-LINITY WH WAT TOTAL FIELD MG/L AS CACO3 (00410)	ALKA-LINITY LAB (MG/L AS CACO3) (90410)	SULFATE DIS-SOLVED (MG/L AS SO4) (00945)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL) (C0940)
08-07-87	7.2	7.3	12.0	210	63	33	5.0	372	376	400	66
08-06-87	7.5	7.5	12.0	180	67	9.4	3.4	295	305	410	21
08-06-87	7.3	7.5	13.0	95	29	110	4.7	323	332	44	170
08-06-87	7.4	7.6	14.0	82	21	18	2.3	238	250	57	18
05-14-87	8.3	8.4	10.0	--	--	--	--	60	--	8.0	0.7
05-14-87	7.9	7.9	9.0	--	--	--	--	156	--	19	7.4
05-14-87	7.9	7.8	8.0	--	--	--	--	106	--	14	11
05-14-87	8.4	8.3	9.0	--	--	--	--	90	--	3.8	77
05-14-87	7.8	7.8	10.0	--	--	--	--	240	--	21	31
05-19-87	7.8	7.9	7.0	--	--	--	--	168	--	17	3.2
05-19-87	6.6	6.7	7.0	--	--	--	--	80	--	27	7.0
05-19-87	8.3	8.4	8.0	--	--	--	--	128	--	8.0	8.0
05-15-87	6.2	6.5	9.5	--	--	--	--	26	--	5.3	20
05-15-87	6.8	7.0	9.0	--	--	--	--	1280	--	33	120
05-15-87	6.5	6.9	9.0	--	--	--	--	660	--	25	82

DATE	FLUO-RIDE, DIS-SOLVED (MG/L AS F) (00950)	SILICA, DIS-SOLVED (MG/L AS SIO2) (00955)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N) (00631)	NITRO-GEN, AMMONIA DIS-SOLVED (MG/L AS N) (00608)	NITRO-GEN,AM-MONIA + ORGANIC DIS. (MG/L AS N) (00623)	PHOS-PHORUS, ORTHO, DIS-SOLVED (MG/L AS P) (00671)	BORON, DIS-SOLVED (UG/L AS B) (01020)	IRON, DIS-SOLVED (UG/L AS FE) (01046)	MANGA-NESE, DIS-SOLVED (UG/L AS MN) (01056)	CARBON, ORGANIC DIS-SOLVED (MG/L AS C) (00681)	CARBON, ORGANIC SUS-PENDED TOTAL (MG/L AS C) (00689)
08-07-87	0.1	26	0.61	--	--	<0.01	280	25	520	10	4.6
08-06-87	0.1	23	<0.10	--	--	<0.01	40	330	130	12	2.7
08-06-87	0.1	23	1.7	--	--	<0.01	70	19	170	4.0	1.1
08-06-87	0.1	18	0.71	--	--	<0.01	70	16	100	7.2	0.8
05-14-87	--	--	1.3	0.25	--	--	--	--	--	--	--
05-14-87	--	--	4.7	0.04	--	--	--	--	--	--	--
05-14-87	--	--	9.5	0.07	--	--	--	--	--	--	--
05-14-87	--	--	0.75	0.05	--	--	--	--	--	--	--
05-14-87	--	--	3.4	0.05	--	--	--	--	--	--	--
05-19-87	--	--	1.0	<0.01	--	--	--	--	--	--	--
05-19-87	--	--	9.5	0.52	--	--	--	--	--	--	--
05-19-87	--	--	0.93	<0.01	--	--	--	--	--	--	--
05-15-87	--	--	0.91	0.05	--	--	--	--	--	--	--
05-15-87	--	--	1.3	--	--	--	--	--	--	--	--
05-15-87	--	--	16	--	2.5	--	--	--	--	--	--

VOLATILE ORGANIC ANALYSES

STATION NUMBER	LOCAL IDENTIFIER	GEOLOGIC UNIT	DATE	TIME	DICHLOROBROMOMETHANE TOTAL (UG/L) (32101)	CARBON-TETRACHLORIDE TOTAL (UG/L) (32102)	1,2-DICHLOROETHANE TOTAL (UG/L) (32103)	BROMOFORM TOTAL (UG/L) (32104)
450303093161707	030N24W27DCC01 MWW4 AT MPLS	112PLSC	08-07-87	1145	<0.2	<0.2	0.8	<0.2
450313093165401	030N24W27CDA01 MWW12 AT ANO	112PLSC	08-06-87	1330	<0.2	<0.2	<0.2	<0.2
450345093165401	030N24W27BAC01 MWW3 AT ANOK	112PLSC	08-06-87	1500	<0.2	<0.2	<0.2	<0.2
450403093164901	030N24W22CDA01 MWW1 AT ANOK	112PLSC	08-06-87	1100	<0.2	<0.2	0.8	<0.2

DATE	CHLORODIBROMOMETHANE TOTAL (UG/L) (32105)	CHLOROFORM TOTAL (UG/L) (32106)	TOLUENE TOTAL (UG/L) (34010)	BENZENE TOTAL (UG/L) (34030)	CHLOROBENZENE TOTAL (UG/L) (34301)	CHLOROETHANE TOTAL (UG/L) (34311)	ETHYLBENZENE TOTAL (UG/L) (34371)	METHYLBROMIDE TOTAL (UG/L) (34413)	METHYLCHLORIDE TOTAL (UG/L) (34418)	METHYLENE CHLORIDE TOTAL (UG/L) (34423)	TETRACHLOROETHYLENE TOTAL (UG/L) (34475)
08-07-87	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.2
08-06-87	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
08-06-87	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
08-06-87	<0.2	<0.2	<0.2	<0.2	<0.2	11	<0.2	<0.2	<0.2	<0.2	<0.2

DATE	TRICHLOROFLUOROMETHANE TOTAL (UG/L) (34488)	1,1-DICHLOROETHANE TOTAL (UG/L) (34496)	1,1-DICHLOROETHYLENE TOTAL (UG/L) (34501)	1,1,1-TRICHLOROETHANE TOTAL (UG/L) (34506)	1,1,2-TRICHLOROETHANE TOTAL (UG/L) (34511)	1,1,2,2 TETRACHLOROETHANE TOTAL (UG/L) (34516)	1,2-DICHLOROBENZENE TOTAL (UG/L) (34536)	1,2-DICHLOROPROPANE TOTAL (UG/L) (34541)	1,2-TRANSDICHLOROETHYLENE TOTAL (UG/L) (34546)	1,3-DICHLOROPROPANE TOTAL (UG/L) (34561)	1,3-DICHLOROBENZENE TOTAL (UG/L) (34566)
08-07-87	<0.2	31	1.7	<0.2	<0.2	<0.2	<0.2	<0.2	76	<0.2	<0.2
08-06-87	<0.2	<0.2	3.7	<0.2	<0.2	<0.2	<0.2	<0.2	94	<0.2	<0.2
08-06-87	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
08-06-87	<0.2	43	7.1	830	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2

DATE	1,4-DICHLOROBENZENE TOTAL (UG/L) (34571)	2-CHLOROETHYLVINYLETHER TOTAL (UG/L) (34576)	DICHLORODIFLUOROMETHANE TOTAL (UG/L) (34668)	TRANS-1,3-DICHLOROPROPENE TOTAL (UG/L) (34699)	CIS 1,3-DICHLOROPROPENE TOTAL (UG/L) (34704)	1,2-DIBROMOETHYLENE TOTAL (UG/L) (39082)	VINYL CHLORIDE TOTAL (UG/L) (39175)	TRICHLOROETHYLENE TOTAL (UG/L) (39180)	STYRENE TOTAL (UG/L) (77128)	XYLENE WATER WHOLE TOT REC (UG/L) (81551)
08-07-87	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	1600	<0.2	<0.2
08-06-87	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	1.1	1900	<0.2	<0.2
08-06-87	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
08-06-87	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2

WATER QUALITY DATA, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

BELTRAMI COUNTY

STATION NUMBER	LOCAL IDENTIFIER	GEO-LOGIC UNIT	DATE	TIME	DEPTH BELOW LAND SURFACE (WATER LEVEL) (FEET) (72019)	DEPTH OF WELL, TOTAL (FEET) (72008)	ELEV. OF LAND SURFACE DATUM (FT. ABOVE NGVD) (72000)
472533094284500	146.30.34 BBB PENNINGTON WE	112DMDF	03-14-87	1530	2.90	13	1315
472537094261700	146.30.25 CCC PENNINGTON EA	112DMDF	08-17-87	1200	9.20	133	1315
472553094384500	146.31.29 CBB LAKE ANDRUSI	112DMDF	09-01-87	1200	4.80	14	1308
472652094532000	146.33.20 ADC BILL SLINEY	112DMDF	08-25-87	1000	14.50	24	1360
472705094521800	146.33.21 ABC CO HWY GARAG	112DMDF	08-04-87	1500	12.78	14	1355
472724095055200	146.35.14 CCC JONES SEC 14	112DMDF	08-27-87	1400	6.10	24	1375
472729094505500	146N33W15DBD ROY CLARK WEL	112DMDF	08-13-87	1030	18.30	21	1363
472740094503400	146.33.15 ADD SCHMUNK PARK	112DMDF	08-12-87	1130	24.10	30	1365
472740094512700	146.33.15BACC NYMORE WATER	112DMDF	09-07-87	1000	5.10	12	1350
472750094523300	146 33.16 BDD BEM SEWAGE P	112DMDF	08-05-87	1100	5.20	10	1345
472757094531100	146.33.17 WOODLAND	112DMDF	08-12-87	1700	5.05	7.0	1345
472816094541200	146.33.8 CBD OLD LANDFILL	112DMDF	07-30-87	1700	1.29	15	1343
472818094525200	A46.33.9 CDC--PAUL BUNYON	112DMDF	07-30-87	0900	3.00	8.0	1342
472846094533700	146.33.8 ABB 15TH&NORTON	112DMDF	08-11-87	1000	15.80	21	1353
472859094464000	146.32.7AAAA BELT CO 12	112DMDF	08-26-87	0900	10.70	14	1358
472907095084100	146.35.5ddc LUNDBERG	112DMDF	08-29-87	1200	31.60	40	1435
472919094540700	146.33.5 CAD CURLING CLUB	112DMDF	07-29-87	1200	20.90	30	1357
472925094525200	146.33.4 BDB DNR IN TOWN	112DMDF	07-30-87	1200	32.52	40	1375
472938094522800	146.33.4 ABB CAMERON PARK	112DMDF	08-10-87	1600	2.30	7.0	1345
472940094531100	146.33.5 AAD 26 AND PARK	112DMDF	08-11-87	1530	26.40	35	1378
472949094531500	146.33.5 29TH AND PARK	112DMDF	08-12-87	1400	7.50	14	1360
473010094494000	147N33W35DBB MOOSBRUGGER	112BRDO	09-05-87	1500	3.00	54	1360
473017094542400	147.33.31 DAA SUPER 8 NORT	112DMDF	07-30-87	1500	17.76	22	1380
473029094565800	HIGHWAY 9 SOUTH	112DMDF	08-05-87	1700	--	13	1381
473031094490100	147.33.36 BBB LANINIA RR	112DMDF	08-12-87	0930	28.00	38	1368
473044095043500	147.35.36 BBC NORTHWOODS P	112DMDF	08-04-87	1800	5.45	14	1407
473045094545400	147.33.30 CDD AIRPORT	112DMDF	08-03-87	1230	7.02	17	1380
473049094524200	147.33.28 CDC OB WELL AT M	112DMDF	07-29-87	1600	0.44	21	1350
473140095041200	147.35.25 BAB LAMMEIS PLANT	112DMDF	08-27-87	1000	8.00	16	1410
473236094505400	147.33.15 BCD DNR NORTH	112DMDF	08-25-87	1600	8.90	20	1355
473238094581400	147.34.15DDA POTATOE FIELD	112DMDF	08-26-87	1700	9.90	15	1394
473306094480000	147.33.13ADA STATE PARK	112DMDF	09-01-87	1700	6.50	14	1370
473318094565300	147.34.13.BBB HWY 9 NORTH	112DMDF	08-28-87	1700	11.10	17	1390
473322094525800	147.33.9CCC NORTHERN TOWN H	112DMDF	08-26-87	1300	11.90	20	1384
473410095073000	147.35.4 DDC PINEWOOD WE	112DMDF	08-27-87	1600	5.90	16	1400
473413094554300	147.34.1DDD J.CRONEMILLER	112DMDF	08-26-87	1500	22.20	24	1395
473512094475100	148N32W31DD-NORDHEIM	112BRDO	09-02-87	1600	20.00	74	1355
473606094481200	148N33W25DA FLEMING	112BRDO	08-19-87	1400	22.00	105	1375
473700094553300	148.34.24 DA CARL WOLF	112BRDO	09-05-87	1100	40.00	68	1355
473721094452200	148N32W21CCC GENE MASON	112BRDO	08-19-87	1600	22.00	44	1360

WATER QUALITY DATA, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

BELTRAMI COUNTY--Continued

DATE	SPE-CIFIC CON-DUCT-ANCE (US/CM) (00095)	SPE-CIFIC CON-DUCT-ANCE LAB (US/CM) (90095)	PH (STAND-ARD UNITS) (00400)	PH LAB (STAND-ARD UNITS) (00403)	TEMPER-ATURE WATER (DEG C) (00010)	BARO-METRIC PRES-SURE (MM OF HG) (00025)	OXYGEN, DIS-SOLVED (MG/L) (00300)	CALCIUM DIS-SOLVED (MG/L AS CA) (00915)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG) (00925)	SODIUM, DIS-SOLVED (MG/L AS NA) (00930)
08-14-87	221	224	7.9	8.4	10.0	745	--	33	6.4	2.8
08-17-87	333	370	7.4	7.7	11.0	740	--	59	10	1.2
09-01-87	414	473	7.4	7.5	10.5	--	--	67	19	4.2
08-25-87	290	373	7.7	7.7	8.0	--	--	58	13	2.3
08-04-87	1800	1910	7.3	7.6	12.0	--	--	110	19	230
08-27-87	525	607	7.2	8.0	10.0	--	--	89	25	4.4
08-13-87	467	479	7.8	7.8	8.5	745	--	69	16	9.7
08-12-87	409	434	7.8	7.8	8.5	745	--	55	12	17
09-07-87	609	796	7.3	7.6	17.0	--	--	97	19	31
08-05-87	918	883	6.7	6.8	14.5	--	--	120	14	22
08-12-87	730	708	7.0	7.5	13.0	745	--	100	19	19
07-30-87	590	625	7.5	7.5	10.5	750	3.7	76	18	38
07-30-87	1070	1080	7.0	7.0	17.0	750	3.8	150	20	49
08-11-87	605	608	7.3	7.4	15.5	750	--	88	18	13
08-26-87	345	350	7.6	7.7	12.5	--	--	57	12	2.7
08-29-87	312	338	7.8	8.2	8.5	--	--	46	14	2.1
07-29-87	1080	1260	6.6	6.9	9.0	--	--	190	64	20
07-30-87	593	650	7.7	8.1	9.5	750	--	--	--	--
08-10-87	890	862	6.9	7.0	17.5	--	--	130	23	23
08-11-87	418	440	7.9	7.8	9.5	750	--	62	11	16
08-12-87	630	631	7.4	7.5	12.5	745	--	78	18	30
09-05-87	--	431	7.8	7.8	12.0	--	--	0.6	0.1	100
07-30-87	550	592	7.9	7.8	9.5	750	5.2	61	13	47
08-05-87	275	291	7.6	8.0	10.5	750	--	43	9.8	2.1
08-12-87	690	722	7.5	7.7	7.5	745	--	84	14	41
08-04-87	697	707	7.0	7.5	9.5	--	--	100	25	22
08-03-87	440	454	7.4	7.6	13.0	750	--	71	17	1.9
07-29-87	410	438	7.5	7.5	9.0	750	2.1	63	18	4.1
08-27-87	452	552	7.3	7.7	10.5	--	--	62	23	1.6
08-25-87	425	485	7.5	7.5	9.5	--	--	73	19	2.4
08-26-87	330	355	7.8	8.2	9.5	--	--	52	9.3	12
09-01-87	366	405	7.6	7.8	9.5	--	--	61	15	1.5
08-28-87	501	558	7.6	7.8	10.5	--	--	82	21	7.6
08-26-87	208	249	8.1	8.1	8.5	--	--	31	9.9	1.8
08-27-87	537	500	6.8	7.0	10.0	14	--	78	22	4.1
08-26-87	485	550	7.6	7.5	8.0	--	--	82	22	2.7
09-02-87	534	574	7.6	7.5	11.5	--	--	81	24	6.1
08-19-87	465	529	7.6	7.6	13.0	745	--	73	22	5.2
09-05-87	506	540	7.7	7.5	9.0	--	--	74	25	4.4
08-19-87	--	663	7.3	7.3	12.0	750	--	92	31	3.3

WATER QUALITY DATA, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

BELTRAMI COUNTY--Continued

DATE	POTAS-SIUM, DIS-SOLVED (MG/L AS K) (00935)	ALKA-LINITY WH WAT TOTAL FIELD (MG/L AS CACO3) (00410)	ALKA-LINITY LAB (MG/L AS CACO3) (90410)	ALKA-LINITY, CARBON-ATE IT-FLD (MG/L CACO3) (00419)	CAR-BONATE WATER WHOLE IT-FLD (MG/L) (00447)	BICAR-BONATE WATER WHOLE IT-FLD (MG/L) (00450)	BICAR-BONATE WH WAT TOTAL FIELD MG/L AS HCO3 (00440)	SULFATE DIS-SOLVED (MG/L AS SO4) (00945)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL) (00940)	FLUO-RIDE, DIS-SOLVED (MG/L AS F) (00950)
08-14-87	0.6	106	111	108	--	--	130	7.1	0.8	0.1
08-17-87	0.9	186	190	186	0	227	--	4.3	1.9	0.1
09-01-87	1.8	250	240	258	0	315	--	4.7	2.6	0.1
08-25-87	1.4	162	173	182	0	222	--	8.2	6.5	0.1
08-04-87	1.6	278	294	270	0	339	--	19	380	0.1
08-27-87	1.7	338	217	332	0	412	--	7.9	2.9	0.1
08-13-87	1.0	214	217	216	0	264	--	11	8.1	0.1
08-12-87	0.9	188	184	190	0	232	--	13	8.8	0.1
09-07-87	1.5	218	191	228	0	278	--	18	85	0.1
08-05-87	36	434	387	434	0	529	--	25	63	0.2
08-12-87	0.7	262	271	262	0	320	--	19	57	0.1
07-30-87	2.8	304	294	--	--	--	--	16	25	0.1
07-30-87	5.0	502	452	--	--	--	--	17	81	0.1
08-11-87	4.3	222	222	222	0	271	--	21	34	0.2
08-26-87	0.7	186	187	188	0	227	--	4.0	0.7	0.1
08-29-87	1.0	--	150	--	--	--	--	6.1	3.2	0.1
07-29-87	5.0	794	770	--	--	--	--	3.1	10	0.1
07-30-87	--	248	251	--	--	--	--	14	40	0.1
08-10-87	3.3	372	367	372	0	454	--	10	64	0.1
08-11-87	1.2	196	200	196	0	--	240	9.1	13	0.1
08-12-87	1.3	254	220	258	0	315	--	13	59	0.1
09-05-87	0.3	236	231	240	--	288	--	5.9	0.4	0.1
07-30-87	2.6	230	223	--	--	--	--	10	52	0.1
08-05-87	0.6	137	138	136	0	166	--	4.2	4.8	0.1
08-12-87	1.4	266	213	266	0	325	--	12	93	0.1
08-04-87	1.6	435	386	437	0	533	--	12	6.8	0.2
08-03-87	1.2	254	248	254	0	310	--	14	1.5	0.2
07-29-87	1.8	266	243	--	--	--	--	2.1	1.1	0.3
08-27-87	2.2	290	197	292	0	356	--	4.0	1.5	0.1
08-25-87	1.0	234	170	236	0	287	--	11	1.2	0.1
08-26-87	1.7	182	175	184	0	224	--	11	0.7	0.1
09-01-87	0.8	202	163	204	0	249	--	9.6	0.7	0.1
08-28-87	1.0	--	224	--	--	--	--	7.7	6.6	0.1
08-26-87	0.4	92	91	92	0	112	--	5.5	15	0.1
08-27-87	1.4	--	293	--	--	--	--	9.9	3.6	0.1
08-26-87	4.7	290	200	294	0	359	--	5.3	1.5	0.1
09-02-87	2.5	300	199	304	0	370	--	6.1	0.4	0.1
08-19-87	2.1	340	293	338	0	412	--	2.8	0.5	0.2
09-05-87	2.6	278	166	278	0	338	--	1.1	0.4	0.2
08-19-87	2.0	364	365	364	0	444	--	11	1.7	0.2

WATER QUALITY DATA, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

BELTRAMI COUNTY--Continued

DATE	SILICA, DIS- SOLVED (MG/L AS SIO2) (00955)	SOLIDS, RESIDUE AT 180 DEG. C DIS- SOLVED (MG/L) (70300)	NITRO- GEN, NO2+NO3 DIS- SOLVED (MG/L AS N) (00631)	NITRO- GEN, AMMONIA DIS- SOLVED (MG/L AS N) (00608)	NITRO- GEN, AM- MONIA + ORGANIC DIS. (MG/L AS N) (00623)	PHOS- PHORUS, DIS- SOLVED (MG/L AS P) (00666)	PHOS- PHORUS, ORTHO, DIS- SOLVED (MG/L AS P) (00671)	ALUM- INUM, DIS- SOLVED (UG/L AS AL) (01106)	ARSENIC DIS- SOLVED (UG/L AS AS) (01000)	BARIUM, DIS- SOLVED (UG/L AS BA) (01005)
08-14-87	19	129	<0.10	<0.01	0.50	0.056	0.046	--	--	--
08-17-87	15	216	0.52	<0.01	0.60	0.019	0.014	--	--	--
09-01-87	20	275	<0.10	0.22	0.70	0.008	0.005	--	--	--
08-25-87	23	218	1.2	0.01	0.30	0.068	0.053	20	2	38
08-04-87	21	1020	1.4	0.03	0.70	0.100	0.067	30	1	92
08-27-87	20	352	<0.10	0.24	0.80	--	0.021	--	--	--
08-13-87	22	281	4.5	<0.01	0.60	0.078	0.074	<10	2	57
08-12-87	21	249	5.3	<0.01	0.40	0.055	0.055	10	<1	41
09-07-87	27	450	6.2	0.02	0.50	0.080	0.063	<10	2	58
08-05-87	43	580	<0.10	8.5	14	0.695	0.695	20	1	290
08-12-87	29	425	0.19	0.03	0.90	0.282	0.223	<10	2	40
07-30-87	22	330	--	0.11	0.60	<0.005	<0.001	<10	1	140
07-30-87	35	659	--	4.2	4.2	0.025	0.014	--	14	300
08-11-87	18	357	7.8	0.03	1.1	0.029	0.029	<10	<1	66
08-26-87	19	203	1.0	0.03	<0.20	0.067	0.062	--	4	--
08-29-87	16	200	4.5	<0.01	0.30	0.028	0.023	--	<1	--
07-29-87	35	787	--	0.20	1.1	0.006	<0.001	10	7	170
07-30-87	--	355	--	0.40	0.70	<0.005	<0.005	--	--	--
08-10-87	29	508	<0.10	0.02	5.4	0.400	0.400	20	1	--
08-11-87	16	246	0.36	0.01	0.40	0.011	0.011	20	<1	53
08-12-87	22	364	2.5	0.02	1.1	0.022	0.019	20	1	55
09-05-87	23	277	<0.10	0.05	<0.20	0.130	0.109	--	--	--
07-30-87	20	328	--	0.02	0.50	0.019	0.014	<10	<1	56
08-05-87	19	174	1.7	0.06	0.40	0.035	0.021	20	1	22
08-12-87	16	448	2.4	0.04	0.40	0.022	0.020	<10	2	48
08-04-87	24	420	<0.10	0.18	0.60	0.009	0.002	20	7	140
08-03-87	17	275	<0.10	0.05	1.0	0.027	0.017	20	1	62
07-29-87	23	240	--	0.04	3.0	0.010	0.002	30	3	96
08-27-87	21	269	0.20	0.22	0.40	0.012	0.004	--	--	--
08-25-87	20	298	0.97	0.02	0.20	0.007	<0.001	--	--	--
08-26-87	11	206	0.20	0.02	0.20	0.006	<0.001	--	<1	--
09-01-87	12	225	<0.10	<0.01	0.40	<0.005	0.001	--	--	--
08-28-87	19	319	3.4	<0.01	0.70	0.013	0.005	--	<1	--
08-26-87	16	147	0.86	<0.01	0.30	0.030	0.024	--	1	--
08-27-87	19	358	<0.10	0.26	1.8	0.076	0.064	--	--	--
08-26-87	21	308	0.31	<0.01	0.30	0.016	0.009	--	<1	--
09-02-87	26	311	<0.10	0.20	0.20	<0.005	<0.001	--	--	--
08-19-87	23	296	<0.10	0.18	1.1	0.011	0.011	--	--	--
09-05-87	22	299	<0.10	0.36	0.50	<0.005	<0.005	--	--	--
08-19-87	25	380	<0.10	0.05	0.40	<0.005	<0.005	--	--	--

BELTRAMI COUNTY--Continued

DATE	BORON, DIS-SOLVED (UG/L AS B) (01020)	CADMIUM DIS-SOLVED (UG/L AS CD) (01025)	CHRO-MIUM, DIS-SOLVED (UG/L AS CR) (01030)	IRON, DIS-SOLVED (UG/L AS FE) (01046)	LEAD, DIS-SOLVED (UG/L AS PB) (01049)	MANGA-NESE, DIS-SOLVED (UG/L AS MN) (01056)	MERCURY DIS-SOLVED (UG/L AS HG) (71890)	SELE-NIUM, DIS-SOLVED (UG/L AS SE) (01145)	CARBON, ORGANIC TOTAL (MG/L AS C) (00680)
08-14-87	--	--	--	--	--	--	--	--	5.8
08-17-87	--	--	--	--	--	--	--	--	2.6
09-01-87	--	--	--	--	--	--	--	--	17
08-25-87	<10	<1	<10	6	<5	2	<0.1	<1	4.9
08-04-87	<10	<1	<10	13	<5	9	<0.1	<1	5.4
08-27-87	--	--	--	--	--	--	--	--	5.8
08-13-87	80	<1	10	5	<5	2	0.2	<1	5.9
08-12-87	40	<1	60	14	<5	10	<0.1	<1	5.5
09-07-87	50	1	<10	8	<5	4	0.1	<1	<0.1
08-05-87	30	<1	<10	8000	<5	700	0.2	<1	44
08-12-87	50	<1	30	6	<5	9	<0.1	<1	8.0
07-30-87	40	<1	<10	2100	<10	220	0.2	<1	8.0
07-30-87	120	2	<10	12000	<10	2300	1.1	<1	11
08-11-87	30	<1	10	8	<5	22	0.2	<1	4.3
08-26-87	--	--	--	16	<10	--	--	--	8.4
08-29-87	--	--	--	9	<10	--	--	--	5.9
07-29-87	40	3	<10	20000	10	1700	0.3	<1	13
07-30-87	60	--	--	--	--	--	0.1	--	4.3
08-10-87	50	<1	<10	2300	<5	590	0.1	<1	11
08-11-87	20	<1	70	22	<5	38	0.2	<1	19
08-12-87	40	<1	<10	7	<5	<1	<0.1	<1	6.2
09-05-87	--	--	--	--	--	--	--	--	4.5
07-30-87	20	<1	<10	<3	<10	1	0.1	<1	6.4
08-05-87	20	<1	30	31	<5	7	0.1	<1	5.3
08-12-87	<10	<1	90	8	<5	7	0.2	<1	4.0
08-04-87	70	<1	310	3600	<5	670	0.1	2	9.4
08-03-87	10	<1	<10	88	<5	800	0.1	<1	12
07-29-87	20	1	<10	150	<10	220	0.1	<1	5.8
08-27-87	--	--	--	--	--	--	--	--	9.5
08-25-87	--	--	--	--	--	--	--	--	7.7
08-26-87	--	--	--	37	<10	--	--	--	9.8
09-01-87	--	--	--	--	--	--	--	--	7.1
08-28-87	--	--	--	6	<10	--	--	--	3.2
08-26-87	--	--	--	12	<10	--	--	--	2.5
08-27-87	--	--	--	--	--	--	--	--	48
08-26-87	--	--	--	15	<10	--	--	--	9.8
09-02-87	--	--	--	--	--	--	--	--	--
08-19-87	--	--	--	--	--	--	--	--	1.1
09-05-87	--	--	--	--	--	--	--	--	2.5
08-19-87	--	--	--	--	--	--	--	--	1.7

WATER QUALITY DATA, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

BELTRAMI COUNTY--Continued

STATION NUMBER	LOCAL IDENTIFIER	GEO-LOGIC UNIT	DATE	TIMF	DEPTH BELOW LAND SURFACE (WATER LEVEL) (FEET) (72019)	DEPTH OF WELL, TOTAL (FEET) (72008)	ELEV. OF LAND SURFACE DATUM (FT. ABOVE NGVD) (72000)	SPE-CIFIC CON-DUCT-ANCE (US/CM) (00095)	SPE-CIFIC CON-DUCT-ANCE LAB (US/CM) (90095)
473957094592000	148N34W03BC HERB RILEY	112BRDO	09-05-87	1200	50.00	116	1385	546	572
474002094453300	148N32W05ADA-MEYERS	112DMDF	09-02-87	1500	42.00	147	1385	785	862

DATE	PH (STAND-ARD UNITS) (00400)	PH LAB (STAND-ARD UNITS) (00403)	TEMPER-ATURE WATER (DEG C) (00010)	CALCIUM DIS-SOLVED (MG/L AS CA) (00915)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG) (00925)	SODIUM, DIS-SOLVED (MG/L AS NA) (00930)	POTAS-SIUM, DIS-SOLVED (MG/L AS K) (00935)	ALKA-LINITY WH WAT TOTAL FIELD (MG/L AS CACO3) (00410)	ALKA-LINITY LAB (MG/L AS CACO3) (90410)	ALKA-LINITY, CARBON-ATE IT-FLD (MG/L CACO3) (00419)	CAR-BONATE WATER WHOLE IT-FLD (MG/L) (00447)	BICAR-BONATE WATER WHOLE IT-FLD (MG/L) (00450)
09-05-87	7.3	7.6	10.0	80	26	4.5	2.5	322	243	328	0	400
09-02-87	7.4	7.6	12.5	0.5	0.2	220	0.8	472	484	468	0	575

DATE	SULFATE DIS-SOLVED (MG/L AS SO4) (00945)	CHLO-RIDE, DIS-SOLVED (MC/L AS CL) (00940)	FLUO-RIDE, DIS-SOLVED (MG/L AS F) (00950)	SILICA, DIS-SOLVED (MG/L AS SIO2) (00955)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L) (70300)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N) (00631)	NITRO-GEN, AMMONIA DIS-SOLVED (MG/L AS N) (00608)	NITRO-GEN,AM-MONIA + ORGANIC DIS. (MG/L AS N) (00623)	PHOS-PHORUS, DIS-SOLVED (MG/L AS P) (00666)	PHOS-PHORUS, ORTHO, DIS-SOLVED (MG/L AS P) (00671)	CARBON, ORGANIC TOTAL (MG/L AS C) (00680)
09-05-87	6.4	0.3	0.2	24	320	<0.10	0.16	0.20	<0.005	0.001	1.6
09-02-87	9.0	2.3	0.2	29	547	<0.10	<0.01	0.20	0.056	0.050	6.1

VOLATILE ORGANIC ANALYSES

STATION NUMBER	LOCAL IDENTIFIER	GEO-LOGIC UNIT	DATE	TIME	DI-CHLORO-BROMO-METHANE TOTAL (UG/L) (32101)	CARBON-TETRA-CHLO-RIDE TOTAL (UG/L) (32102)	1,2-DI-CHLORO-ETHANE TOTAL (UG/L) (32103)	BROMO-FORM TOTAL (UG/L) (32104)
472705094521800	146.33.21 ABC CO HWY GARAG	112DMDF	08-04-87	1500	<3.0	<3.0	<3.0	<3.0
472750094523300	146.33.16 BDD BEM SEWAGE P	112DMDF	08-05-87	1100	<3.0	<3.0	<3.0	<3.0
472816094541200	146.33.8 CBD OLD LANDFILL	112DMDF	07-30-87	1700	<3.0	<3.0	<3.0	<3.0
472818094525200	A46.33.9 CDC--PAUL BUNYON	112DMDF	07-30-87	0900	<3.0	<3.0	<3.0	<3.0
472859094464000	146.32.7AAAA BELT CO 12	112DMDF	08-26-87	0900	--	--	--	--
472907095084100	146.35.5ddc LUNDBERG	112DMDF	08-29-87	1200	--	--	--	--
472919094540700	146.33.5 CAD CURLING CLUB	112DMDF	07-29-87	1200	<3.0	<3.0	<3.0	<3.0
473017094542400	147.33.31 DAA SUPER 8 NORT	112DMDF	07-30-87	1500	<3.0	<3.0	<3.0	<3.0
473029094565800	HIGHWAY 9 SOUTH	112DMDF	08-05-87	1700	<3.0	<3.0	<3.0	<3.0
473044095043500	147.35.36 BBC NORTHWOODS P	112DMDF	08-04-87	1800	<3.0	<3.0	<3.0	<3.0
473045094545400	147.33.30 CDD AIRPORT	112DMDF	08-03-87	1230	<3.0	<3.0	<3.0	<3.0
473049094524200	147.33.28 CDC OB WELL AT M	112DMDF	07-29-87	1600	<3.0	<3.0	<3.0	<3.0
473238094581400	147.34.15DDA POTATOE FIELD	112DMDF	08-26-87	1700	--	--	--	--
473318094565300	147.34.13.BBB HWY 9 NORTH	112DMDF	08-28-87	1700	--	--	--	--
473322094525800	147.33.9CCC NORTHERN TOWN H	112DMDF	08-26-87	1300	--	--	--	--
473413094554300	147.34.1DDD J.CRONEMILLER	112DMDF	08-26-87	1500	--	--	--	--

BELTRAMI COUNTY--Continued

VOLATILE ORGANIC ANALYSES--Continued

DATE	CHLORO-DI-BROMO-METHANE TOTAL (UG/L) (32105)	CHLORO-FORM TOTAL (UG/L) (32106)	TOLUENE TOTAL (UG/L) (34010)	BENZENE TOTAL (UG/L) (34030)	CHLORO-BENZENE TOTAL (UG/L) (34301)	CHLORO-ETHANE TOTAL (UG/L) (34311)	ETHYL-BENZENE TOTAL (UG/L) (34371)	METHYL-BROMIDE TOTAL (UG/L) (34413)	METHYL-CHLO-RIDE TOTAL (UG/L) (34418)	METHYL-ENE CHLO-RIDE TOTAL (UG/L) (34423)	TETRA-CHLORO-ETHYL-ENE TOTAL (UG/L) (34475)
08-04-87	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
08-05-87	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
07-30-87	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<14	<3.0
07-30-87	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<11	<3.0
08-26-87	--	--	--	--	--	--	--	--	--	--	--
08-29-87	--	--	--	--	--	--	--	--	--	--	--
07-29-87	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<14	<3.0
07-30-87	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<16	<3.0
08-05-87	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
08-04-87	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
08-03-87	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
07-29-87	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	27	<3.0
08-26-87	--	--	--	--	--	--	--	--	--	--	--
08-28-87	--	--	--	--	--	--	--	--	--	--	--
08-26-87	--	--	--	--	--	--	--	--	--	--	--
08-26-87	--	--	--	--	--	--	--	--	--	--	--

DATE	TRI-CHLORO-FLUORO-METHANE TOTAL (UG/L) (34488)	1,1-DI-CHLORO-ETHANE TOTAL (UG/L) (34496)	1,1-DI-CHLORO-ETHYL-ENE TOTAL (UG/L) (34501)	1,1,1-TRI-CHLORO-ETHANE TOTAL (UG/L) (34506)	1,1,2-TRI-CHLORO-ETHANE TOTAL (UG/L) (34511)	1,1,2,2 TETRA-CHLORO-ETHANE TOTAL (UG/L) (34516)	1,2-DI-CHLORO-BENZENE TOTAL (UG/L) (34536)	1,2-DI-CHLORO-PROPANE TOTAL (UG/L) (34541)	TRANSDI CHLORO-ETHYL-ENE TOTAL (UG/L) (34546)	1,2-1,3-DI-CHLORO-PROPANE TOTAL (UG/L) (34561)	1,3-DI-CHLORO-BENZENE TOTAL (UG/L) (34566)
08-04-87	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
08-05-87	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
07-30-87	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
07-30-87	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
08-26-87	--	--	--	--	--	--	--	--	--	--	--
08-29-87	--	--	--	--	--	--	--	--	--	--	--
07-29-87	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	17	<3.0	<3.0
07-30-87	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
08-05-87	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
08-04-87	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
08-03-87	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
07-29-87	3.9	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
08-26-87	--	--	--	--	--	--	--	--	--	--	--
08-28-87	--	--	--	--	--	--	--	--	--	--	--
08-26-87	--	--	--	--	--	--	--	--	--	--	--
08-26-87	--	--	--	--	--	--	--	--	--	--	--

VOLATILE ORGANIC ANALYSES--Continued

DATE	1,4-DI-CHLORO-BENZENE TOTAL (UG/L) (34571)	2-CHLORO-ETHYL-VINYL-ETHER TOTAL (UG/L) (34576)	DI-CHLORO-DI-FLUORO-METHANE TOTAL (UG/L) (34668)	TRANS-1,3-DI-CHLORO-PROPENE TOTAL (UG/L) (34699)	CIS 1,3-DI-CHLORO-PROPENE TOTAL (UG/L) (34704)	PRO-PAZINE TOTAL (UG/L) (39024)	TRI-FLURA-LIN TOTAL RECOVER (UG/L) (39030)	SIME-TRYNE TOTAL (UG/L) (39054)	SIMA-ZINE TOTAL (UG/L) (39055)	PROME-TONE TOTAL (UG/L) (39056)	PROME-TRYNE TOTAL (UG/L) (39057)
08-04-87	<3.0	<3.0	<3.0	<3.0	<3.0	--	--	--	--	--	--
08-05-87	<3.0	<3.0	<3.0	<3.0	<3.0	--	--	--	--	--	--
07-30-87	<3.0	<3.0	<3.0	<3.0	<3.0	--	--	--	--	--	--
07-30-87	<3.0	<3.0	<3.0	<3.0	<3.0	--	--	--	--	--	--
08-26-87	--	--	--	--	--	<0.10	<0.10	<0.1	<0.10	<0.1	<0.1
08-29-87	--	--	--	--	--	<0.10	<0.10	<0.1	<0.10	<0.1	<0.1
07-29-87	<3.0	<3.0	5.5	<3.0	<3.0	--	--	--	--	--	--
07-30-87	<3.0	<3.0	<3.0	<3.0	<3.0	--	--	--	--	--	--
08-05-87	<3.0	<3.0	<3.0	<3.0	<3.0	--	--	--	--	--	--
08-04-87	<3.0	<3.0	<3.0	<3.0	<3.0	--	--	--	--	--	--
08-03-87	<3.0	<3.0	<3.0	<3.0	<3.0	--	--	--	--	--	--
07-29-87	<3.0	<3.0	<3.0	<3.0	<3.0	--	--	--	--	--	--
08-26-87	--	--	--	--	--	<0.10	<0.10	<0.1	<0.10	<0.1	<0.1
08-28-87	--	--	--	--	--	<0.10	<0.10	<0.1	<0.10	<0.1	<0.1
08-26-87	--	--	--	--	--	<0.10	<0.10	<0.1	<0.10	<0.1	<0.1
08-26-87	--	--	--	--	--	<0.10	<0.10	<0.1	<0.10	<0.1	<0.1

DATE	1,2-DIBROMO ETHYL-ENE TOTAL (UG/L) (39082)	VINYL CHLO-RIDE TOTAL (UG/L) (39175)	TRI-CHLORO-ETHYL-ENE TOTAL (UG/L) (39180)	ATRA-ZINE, TOTAL (UG/L) (39630)	STYRENE TOTAL (UG/L) (77128)	ALA-CHLOR TOTAL RECOVER (UG/L) (77825)	XYLENE WATER WHOLE TOT REC (UG/L) (81551)	CYAN-AZINE TOTAL (UG/L) (81757)	AME-TRYNE TOTAL (82184)	METRI-BUZIN WATER WHOLE TOT.REC (UG/L) (82611)	METOLA-CHLOR WATER WHOLE TOT.REC (UG/L) (82612)
08-04-87	<3.0	<3.0	<3.0	--	<3.0	--	<3.0	--	--	--	--
08-05-87	<3.0	<3.0	<3.0	--	<3.0	--	<3.0	--	--	--	--
07-30-87	<3.0	<3.0	<3.0	--	<3.0	--	<3.0	--	--	--	--
07-30-87	<3.0	<3.0	<3.0	--	<3.0	--	<3.0	--	--	--	--
08-26-87	--	--	--	<0.10	--	<0.10	--	<0.10	<0.10	<0.1	<0.1
08-29-87	--	--	--	<0.10	--	<0.10	--	<0.10	<0.10	<0.1	<0.1
07-29-87	<3.0	<3.0	<3.0	--	<3.0	--	<3.0	--	--	--	--
07-30-87	<3.0	<3.0	<3.0	--	<3.0	--	<3.0	--	--	--	--
08-05-87	<3.0	<3.0	<3.0	--	<3.0	--	<3.0	--	--	--	--
08-04-87	<3.0	<3.0	<3.0	--	<3.0	--	<3.0	--	--	--	--
08-03-87	<3.0	<3.0	<3.0	--	<3.0	--	<3.0	--	--	--	--
07-29-87	<3.0	<3.0	<3.0	--	<3.0	--	<3.0	--	--	--	--
08-26-87	--	--	--	<0.10	--	<0.10	--	<0.10	<0.10	<0.1	<0.1
08-28-87	--	--	--	<0.10	--	<0.10	--	<0.10	<0.10	<0.1	<0.1
08-26-87	--	--	--	<0.10	--	<0.10	--	<0.10	<0.10	<0.1	<0.1
08-26-87	--	--	--	<0.10	--	<0.10	--	<0.10	<0.10	<0.1	<0.1

WATER QUALITY DATA, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

CASS COUNTY

STATION NUMBER	LOCAL IDENTIFIER	GEO-LOGIC UNIT	DATE	TIME	DEPTH BELOW LAND SURFACE (WATER LEVEL) (FEET) (72019)	DEPTH OF WELL, TOTAL (FEET) (72008)	ELEV. OF LAND SURFACE DATUM (FT. ABOVE NGVD) (72000)	SPE-CIFIC CON-DUCT-ANCE (US/CM) (00095)	SPE-CIFIC CON-DUCT-ANCE LAB (US/CM) (90095)
471546094331700	144.31.25BBC WELSH LAKE	112DMDF	08-17-87	1500	7.50	13	1300	260	253
472201094320400	145.30.19 BAA PIKE BAY EAST	112DMDF	08-17-87	1800	20.50	28	1325	476	497
472240094361400	145.31.15 ACB CASS L RR	112DMDF	08-06-87	1100	16.88	23	1320	--	579
472250094395300	145.31.18 BAB CASS LAKE NO	112DMDF	08-06-87	1400	15.70	23	1320	345	361
472720095121800	146.36.24 BBB CHRISTOFFERSE	112DMDF	08-29-87	1600	32.70	40	1462	451	487
473423095241800	147.37.6 AAA ULRICH	112DMDF	07-31-87	1200	9.22	16	1545	380	419

DATE	PH (STAND-ARD UNITS) (00400)	PH LAB (STAND-ARD UNITS) (00403)	TEMPER-ATURE WATER (DEG C) (00010)	BARO-METRIC PRES-SURE (MM OF HG) (00025)	CALCIUM DIS-SOLVED (MG/L AS CA) (00915)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG) (00925)	SODIUM DIS-SOLVED (MG/L AS NA) (00930)	POTAS-SIUM, DIS-SOLVED (MG/L AS K) (00935)	ALKA-LINITY WH WAT TOTAL FIELD (MG/L AS CACO3) (00410)	ALKA-LINITY LAB (MG/L AS CACO3) (90410)	ALKA-LINITY, CARBON-ATE IT-FLD (MG/L CACO3) (00419)	CAR-BONATE WATER WHOLE IT-FLD (MG/L) (00447)
08-17-87	7.3	7.5	9.5	740	41	4.5	2.9	1.8	108	118	108	0
08-17-87	7.3	7.8	8.0	740	78	17	3.1	1.2	248	245	248	0
08-06-87	6.8	7.0	10.5	750	99	14	3.4	1.2	316	307	326	0
08-06-87	7.5	7.9	9.0	750	56	13	2.2	0.9	196	191	198	0
08-29-87	7.5	7.8	7.5	--	65	23	2.3	1.3	--	248	--	--
07-31-87	7.4	7.6	13.0	740	63	16	3.5	3.7	270	250	--	--

DATE	BICAR-BONATE WATER WHOLE IT-FLD (MG/L) (00450)	SULFATE DIS-SOLVED (MG/L AS SO4) (00945)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL) (00940)	FLUO-RIDE, DIS-SOLVED (MG/L AS F) (00950)	SILICA, DIS-SOLVED (MG/L AS SIO2) (00955)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L) (70300)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N) (00631)	NITRO-GEN, AMMONIA DIS-SOLVED (MG/L AS N) (00608)	NITRO-GEN, AM-MONIA + ORGANIC DIS. (MG/L AS N) (00623)	PHOS-PHORUS, DIS-SOLVED (MG/L AS P) (00666)	PHOS-PHORUS, ORTHO, DIS-SOLVED (MG/L AS P) (00671)	ALUM-INUM, DIS-SOLVED (UG/L AS AL) (01106)
08-17-87	132	12	0.6	0.1	1.9	153	<0.10	0.01	0.60	0.018	0.016	--
08-17-87	302	14	0.8	0.1	16	280	<0.10	0.02	0.40	0.047	0.039	--
08-06-87	398	14	1.0	0.1	32	370	<0.10	0.12	1.9	0.011	<0.001	20
08-06-87	241	5.8	0.6	0.2	20	207	0.48	0.02	0.50	0.044	0.032	20
08-29-87	--	6.4	1.5	0.1	24	281	2.2	0.01	0.50	0.020	0.017	--
07-31-87	--	4.0	0.5	0.1	27	246	--	<0.01	0.40	0.034	0.034	--

DATE	ARSENIC DIS-SOLVED (UG/L AS AS) (01000)	BARIUM, DIS-SOLVED (UG/L AS BA) (01005)	BORON, DIS-SOLVED (UG/L AS B) (01020)	CADMIUM DIS-SOLVED (UG/L AS CD) (01025)	CHRO-MIUM, DIS-SOLVED (UG/L AS CR) (01030)	IRON, DIS-SOLVED (UG/L AS FE) (01046)	LEAD, DIS-SOLVED (UG/L AS PB) (01049)	MANGA-NESE, DIS-SOLVED (UG/L AS MN) (01056)	MERCURY DIS-SOLVED (UG/L AS HG) (71890)	SELE-NIUM, DIS-SOLVED (UG/L AS SE) (01145)	CARBON, ORGANIC TOTAL (MG/L AS C) (00680)
08-17-87	--	--	--	--	--	--	--	--	--	--	3.9
08-17-87	--	--	--	--	--	--	--	--	--	--	8.9
08-06-87	4	150	80	<1	<10	5400	<5	4800	<0.1	<1	19
08-06-87	<1	44	20	<1	<10	43	<5	13	<0.1	<1	11
08-29-87	<1	--	--	--	--	7	<10	--	--	--	3.6
07-31-87	1	--	--	--	--	33	<10	--	--	--	--

WATER QUALITY DATA, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

CASS COUNTY--Continued

VOLATILE ORGANIC ANALYSES

STATION NUMBER	LOCAL IDENTIFIER	GEO-LOGIC UNIT	DATE	TIME	DI-CHLORO-BROMO-METHANE TOTAL (UG/L) (32101)	CARBON-TETRA-CHLO-RIDE TOTAL (UG/L) (32102)	1,2-DI-CHLORO-ETHANE TOTAL (UG/L) (32103)	BROMO-FORM TOTAL (UG/L) (32104)
472240094361400	145.31.15 ACB CASS L RR	112DMDF	08-06-87	1100	<3.0	<3.0	<3.0	<3.0
472250094395300	145.31.18 BAB CASS LAKE NO	112DMDF	08-06-87	1400	<3.0	<3.0	<3.0	<3.0
472720095121800	146.36.24 BBB CHRISTOFFERSE	112DMDF	08-29-87	1600	--	--	--	--
473423095241800	147.37.6 AAA ULRICH	112DMDF	07-31-87	1200	--	--	--	--

DATE	CHLORO-DI-BROMO-METHANE TOTAL (UG/L) (32105)	CHLORO-FORM TOTAL (UG/L) (32106)	TOLUENE TOTAL (UG/L) (34010)	BENZENE TOTAL (UG/L) (34030)	CHLORO-BENZENE TOTAL (UG/L) (34301)	CHLORO-ETHANE TOTAL (UG/L) (34311)	ETHYL-BENZENE TOTAL (UG/L) (34371)	METHYL-BROMIDE TOTAL (UG/L) (34413)	METHYL-CHLO-RIDE TOTAL (UG/L) (34418)	METHYL-ENE CHLO-RIDE TOTAL (UG/L) (34423)	TETRA-CHLORO-ETHYL-ENE TOTAL (UG/L) (34475)
08-06-87	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
08-06-87	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
08-29-87	--	--	--	--	--	--	--	--	--	--	--
07-31-87	--	--	--	--	--	--	--	--	--	--	--

DATE	TRI-CHLORO-FLUORO-METHANE TOTAL (UG/L) (34488)	1,1-DI-CHLORO-ETHANE TOTAL (UG/L) (34496)	1,1-DI-CHLORO-ETHYL-ENE TOTAL (UG/L) (34501)	1,1,1-TRI-CHLORO-ETHANE TOTAL (UG/L) (34506)	1,1,2-TRI-CHLORO-ETHANE TOTAL (UG/L) (34511)	1,1,2,2 TETRA-CHLORO-ETHANE TOTAL (UG/L) (34516)	1,2-DI-CHLORO-BENZENE TOTAL (UG/L) (34536)	1,2-DI-CHLORO-PROPANE TOTAL (UG/L) (34541)	1,2-TRANSDI CHLORO-ETHYL-ENE TOTAL (UG/L) (34546)	1,3-DI-CHLORO-PROPANE TOTAL (UG/L) (34561)	1,3-DI-CHLORO-BENZENE TOTAL (UG/L) (34566)
08-06-87	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
08-06-87	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
08-29-87	--	--	--	--	--	--	--	--	--	--	--
07-31-87	--	--	--	--	--	--	--	--	--	--	--

DATE	1,4-DI-CHLORO-BENZENE TOTAL (UG/L) (34571)	2-CHLORO-ETHYL-VINYL-ETHER TOTAL (UG/L) (34576)	DI-CHLORO-DI-FLUORO-METHANE TOTAL (UG/L) (34668)	TRANS-1,3-DI-CHLORO-PROPENE TOTAL (UG/L) (34699)	CIS 1,3-DI-CHLORO-PROPENE TOTAL (UG/L) (34704)	PRO-PAZINE TOTAL (UG/L) (39024)	TRI-FLURA-LIN TOTAL RECOVER (UG/L) (39030)	SIME-TRYNE TOTAL (UG/L) (39054)	SIMA-ZINE TOTAL (UG/L) (39055)	PROME-TONE TOTAL (UG/L) (39056)	PROME-TRYNE TOTAL (UG/L) (39057)
08-06-87	<3.0	<3.0	<3.0	<3.0	<3.0	--	--	--	--	--	--
08-06-87	<3.0	<3.0	<3.0	<3.0	<3.0	--	--	--	--	--	--
08-29-87	--	--	--	--	--	<0.10	<0.10	<0.1	<0.10	<0.1	<0.1
07-31-87	--	--	--	--	--	<0.10	<0.10	<0.1	<0.10	<0.1	<0.1

DATE	1,2-DIBROMO ETHYL-ENE TOTAL (UG/L) (39082)	VINYL CHLO-RIDE TOTAL (UG/L) (39175)	TRI-CHLORO-ETHYL-ENE TOTAL (UG/L) (39180)	ATRA-ZINE, TOTAL (UG/L) (39630)	STYRENE TOTAL (UG/L) (77128)	ALA-CHLOR TOTAL RECOVER (UG/L) (77825)	XYLENE WATER WHOLE TOT REC (UG/L) (81551)	CYAN-AZINE TOTAL (UG/L) (81757)	AME-TRYNE TOTAL (82184)	METRI-BUZIN WATER WHOLE TOT.REC (UG/L) (82611)	METOLA-CHLOR WATER WHOLE TOT.REC (UG/L) (82612)
08-06-87	<3.0	<3.0	<3.0	--	<3.0	--	<3.0	--	--	--	--
08-06-87	<3.0	<3.0	<3.0	--	<3.0	--	<3.0	--	--	--	--
08-29-87	--	--	--	<0.10	--	<0.10	--	<0.10	<0.10	<0.1	<0.1
07-31-87	--	--	--	<0.10	--	<0.10	--	<0.10	<0.10	<0.1	<0.1

WATER QUALITY DATA, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

CHISAGO COUNTY

STATION NUMBER	LOCAL IDENTIFIER	GEO- LOGIC UNIT	DATE	TIME	DEPTH BELOW LAND SURFACE (WATER LEVEL) (FEET) (72019)	DEPTH OF WELL, TOTAL (FEET) (72008)	ELEV. OF LAND SURFACE DATUM (FT. ABOVE NGVD) (72000)
452837092525901	035N20W31DAB01WHEELER_S(C1)	112OTSH	05-19-87	0930	8.08	13	875

DATE	SPE- CIFIC CON- DUCT- ANCE (US/CM) (00095)	SPE- CIFIC CON- DUCT- ANCE LAB (US/CM) (90095)	PH (STAND- ARD UNITS) (00400)	PH LAB (STAND- ARD UNITS) (00403)	TEMPER- ATURE WATER (DEG C) (00010)	ALKA- LINITY WH WAT TOTAL FIELD (MG/L AS CACO3) (00410)	SULFATE DIS- SOLVED (MG/L AS SO4) (00945)	CHLO- RIDE, DIS- SOLVED (MG/L AS CL) (00940)	NITRO- GEN, NO2+NO3 DIS- SOLVED (MG/L AS N) (00631)	NITRO- GEN, AMMONIA DIS- SOLVED (MG/L AS N) (00608)
05-19-87	179	175	6.6	7.0	7.0	34	6.0	3.0	5.5	0.11

CLEARWATER COUNTY

STATION NUMBER	LOCAL IDENTIFIER	GEO- LOGIC UNIT	DATE	TIME	DEPTH BELOW LAND SURFACE (WATER LEVEL) (FEET) (72019)	DEPTH OF WELL, TOTAL (FEET) (72008)	ELEV. OF LAND SURFACE DATUM (FT. ABOVE NGVD) (72000)
472813095160200	146.36.16BBB MOOSE CREEK	112DMDF	09-04-87	1800	31.80	36	1525
473057095184000	147.36.25 CDC SHEVLIN EAST	112DMDF	09-04-87	1700	3.40	8.5	1425
473131095160600	147.36.28BBC SHEVLIN SOUTH	112DMDF	08-31-87	1700	2.00	8.0	1445
473232095152900	147.36.21.ABA SHEVLIN NORT	112DMDF	08-31-87	1600	4.10	9.5	1465

DATE	SPE- CIFIC CON- DUCT- ANCE (US/CM) (00095)	SPE- CIFIC CON- DUCT- ANCE LAB (US/CM) (90095)	PH (STAND- ARD UNITS) (00400)	PH LAB (STAND- ARD UNITS) (00403)	TEMPER- ATURE WATER (DEG C) (00010)	BARO- METRIC PRES- SURE (MM OF HG) (00025)	CALCIUM DIS- SOLVED (MG/L AS CA) (00915)	MAGNE- SIUM, DIS- SOLVED (MG/L AS MG) (00925)	SODIUM, DIS- SOLVED (MG/L AS NA) (00930)	POTAS- SIUM, DIS- SOLVED (MG/L AS K) (00935)
09-04-87	540	732	7.2	7.5	9.5	--	88	43	1.1	2.7
09-04-87	535	580	7.3	7.3	14.0	--	84	22	2.9	2.0
08-31-87	555	636	7.4	7.5	11.0	--	99	22	3.3	2.1
08-31-87	360	385	7.4	7.5	11.5	750	60	14	3.3	1.2

QUALITY OF GROUND WATER

WATER QUALITY DATA, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

CLEARWATER COUNTY--Continued

DATE	ALKA-LINITY WH WAT TOTAL FIELD (MG/L AS CACO3) (00410)	ALKA-LINITY LAB (MG/L AS CACO3) (90410)	ALKA-LINITY, CARBON-ATE IT-FLD (MG/L CACO3) (00419)	CAR-BONATE WATER WHOLE IT-FLD (MG/L) (00447)	BICAR-BONATE WATER WHOLE IT-FLD (MG/L) (00450)	SULFATE DIS-SOLVED (MG/L AS SO4) (00945)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL) (00940)	FLUO-RIDE, DIS-SOLVED (MG/L AS F) (00950)	SILICA, DIS-SOLVED (MG/L AS SIO2) (00955)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L) (70300)
09-04-87	462	314	474	0	578	7.6	0.6	0.2	22	426
09-04-87	302	308	302	0	368	9.2	2.8	0.1	22	331
08-31-87	304	258	308	0	375	6.2	4.5	0.1	26	374
08-31-87	196	197	200	0	244	12	3.4	0.1	12	223

DATE	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N) (00631)	NITRO-GEN, AMMONIA DIS-SOLVED (MG/L AS N) (00608)	NITRO-GEN,AM-MONIA + ORGANIC DIS. (MG/L AS N) (00623)	PHOS-PHORUS, DIS-SOLVED (MG/L AS P) (00666)	PHOS-PHORUS, ORTHO, DIS-SOLVED (MG/L AS P) (00671)	ARSENIC DIS-SOLVED (UG/L AS AS) (01000)	IRON, DIS-SOLVED (UG/L AS FE) (01046)	LEAD, DIS-SOLVED (UG/L AS PB) (01049)	CARBON, ORGANIC TOTAL (MG/L AS C) (00680)
09-04-87	0.14	0.06	<0.20	<0.005	0.002	--	--	--	7.9
09-04-87	<0.10	0.03	0.30	0.060	0.060	1	33	<10	9.4
08-31-87	0.43	0.05	0.50	0.018	0.001	1	18	<10	6.5
08-31-87	0.64	0.02	0.30	0.032	0.025	<1	33	<10	2.9

VOLATILE ORGANIC ANALYSES

STATION NUMBER	LOCAL IDENTIFIER	GEO-LOGIC UNIT	DATE	TIME	PRO-PAZINE TOTAL (UG/L) (39024)	TRI-FLURA-LIN TOTAL RECOVER (UG/L) (39030)	SIME-TRYNE TOTAL (UG/L) (39054)
473057095184000	147.36.25 CDC SHEVLIN EAST	112DMDF	09-04-87	1700	<0.10	<0.10	<0.1
473131095160600	147.36.28BBC SHEVLIN SOUTH	112DMDF	08-31-87	1700	<0.10	<0.10	<0.1
473232095152900	147.36.21.ABA SHEVLIN NORT	112DMDF	08-31-87	1600	<0.10	<0.10	<0.1

DATE	SIMA-ZINE TOTAL (UG/L) (39055)	PROME-TONE TOTAL (UG/L) (39056)	PROME-TRYNE TOTAL (UG/L) (39057)	ATRA-ZINE, TOTAL (UG/L) (39630)	ALA-CHLOR TOTAL RECOVER (UG/L) (77825)	CYAN-AZINE TOTAL (UG/L) (81757)	AME-TRYNE TOTAL (82184)	METRI-BUZIN WATER WHOLE TOT.REC (UG/L) (82611)	METOLA-CHLOR WATER WHOLE TOT.REC (UG/L) (82612)
09-04-87	<0.10	<0.1	<0.1	<0.10	<0.10	<0.10	<0.10	<0.1	<0.1
08-31-87	<0.10	<0.1	<0.1	2.9	<0.10	<0.10	<0.10	<0.1	<0.1
08-31-87	<0.10	<0.1	<0.1	<0.10	<0.10	<0.10	<0.10	<0.1	<0.1

QUALITY OF GROUND WATER

WATER QUALITY DATA, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

HUBBARD COUNTY

STATION NUMBER	LOCAL IDENTIFIER	GEO-LOGIC UNIT	DATE	TIME	DEPTH BELOW LAND SURFACE (WATER LEVEL) (FEET) (72019)	DEPTH OF WELL, TOTAL (FEET) (72008)	ELEV. OF LAND SURFACE DATUM (FT. ABOVE NGVD) (72000)
471222094445800	143N32W17AAA MOSS 1	112BRDO	09-03-87	1200	27.00	94	1350
471408095004300	143.34.5 ACA LAKE GEORGE NO	112DMDF	09-04-87	1400	18.60	38	1430
472103095030100	145.34.30 BB REDDING	112BRDO	09-03-87	1700	10.00	51	1454
472347094461000	145.32.5 CDD CHRISTIANSON	112BRDO	09-01-87	1500	36.00	110	1370
472409094592200	145N34W03CBB COLEMANN	112BRDO	09-03-87	1500	52.00	76	1404

DATE	SPE-CIFIC CON-DUCT-ANCE (US/CM) (00095)	SPE-CIFIC CON-DUCT-ANCE LAB (US/CM) (90095)	PH (STAND-ARD UNITS) (00400)	PH LAB (STAND-ARD UNITS) (00403)	TEMPER-ATURE WATER (DEG C) (00010)	CALCIUM DIS-SOLVED (MG/L AS CA) (00915)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG) (00925)	SODIUM, DIS-SOLVED (MG/L AS NA) (00930)	POTAS-SIUM, DIS-SOLVED (MG/L AS K) (00935)	ALKA-LINITY WH WAT TOTAL FIELD (MG/L AS CACO3) (00410)
09-03-87	555	625	7.5	7.4	12.5	88	27	7.1	1.9	--
09-04-87	332	339	7.6	7.9	7.5	50	13	3.4	1.0	162
09-03-87	581	615	7.0	7.3	11.5	94	22	4.0	3.1	206
09-01-87	459	504	7.6	7.7	8.0	74	20	2.7	1.6	270
09-03-87	374	408	7.4	7.7	8.5	60	16	2.3	1.0	206

DATE	ALKA-LINITY LAB (MG/L AS CACO3) (90410)	ALKA-LINITY, CARBON-ATE IT-FLD (MG/L CACO3) (00419)	CAR-BONATE WATER WHOLE IT-FLD (MG/L) (00447)	BICAR-BONATE WATER WHOLE IT-FLD (MG/L) (00450)	SULFATE DIS-SOLVED (MG/L AS SO4) (00945)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL) (00940)	FLUO-RIDE, DIS-SOLVED (MG/L AS F) (00950)	SILICA, DIS-SOLVED (MG/L AS SIO2) (00955)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L) (70300)
09-03-87	217	344	0	419	40	0.4	0.2	19	342
09-04-87	162	162	0	198	9.3	1.5	0.1	15	184
09-03-87	181	210	0	256	3.5	0.7	0.1	27	362
09-01-87	185	272	0	331	5.9	0.6	0.1	18	281
09-03-87	212	210	--	256	11	0.6	0.1	18	227

DATE	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N) (00631)	NITRO-GEN, AMMONIA DIS-SOLVED (MG/L AS N) (00608)	NITRO-GEN,AM-MONIA + ORGANIC DIS. (MG/L AS N) (00623)	PHOS-PHORUS, DIS-SOLVED (MG/L AS P) (00666)	PHOS-PHORUS, ORTHO, DIS-SOLVED (MG/L AS P) (00671)	ARSENIC DIS-SOLVED (UG/L AS AS) (01000)	IRON, DIS-SOLVED (UG/L AS FE) (01046)	LEAD, DIS-SOLVED (UG/L AS PB) (01049)	CARBON, ORGANIC TOTAL (MG/L AS C) (00680)
09-03-87	<0.10	0.08	<0.20	<0.005	0.001	--	--	--	1.0
09-04-87	0.32	0.03	<0.20	0.015	0.015	<1	7	10	10
09-03-87	<0.10	1.2	1.5	<0.005	<0.001	--	--	--	6.1
09-01-87	<0.10	0.04	0.40	0.006	0.003	--	--	--	0.5
09-03-87	0.30	<0.01	<0.20	0.037	0.027	--	--	--	0.7

QUALITY OF GROUND WATER

WATER QUALITY DATA, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

HUBBARD COUNTY--Continued

VOLATILE ORGANIC ANALYSES

STATION NUMBER	LOCAL IDENTIFIER	GEO-LOGIC UNIT	DATE	TIME	PRO-PAZINE TOTAL (UG/L) (39024)	TRI-FLURA-LIN TOTAL RECOVER (UG/L) (39030)	SIME-TRYNE TOTAL (UG/L) (39054)
471408095004300	143.34.5 ACA LAKE GEORGE NO	112DMDF	09-04-87	1400	<0.10	<0.10	<0.1

DATE	SIMA-ZINE TOTAL (UG/L) (39055)	PROME-TONE TOTAL (UG/L) (39056)	PROME-TRYNE TOTAL (UG/L) (39057)	ATRA-ZINE, TOTAL (UG/L) (39630)	ALA-CHLOR TOTAL RECOVER (UG/L) (77825)	CYAN-AZINE TOTAL (UG/L) (81757)	AME-TRYNE TOTAL (82184)	METRI-BUZIN WATER WHOLE TOT.REC (UG/L) (82611)	METOLA-CHLOR WATER WHOLE TOT.REC (UG/L) (82612)
09-04-87	<0.10	<0.1	<0.1	<0.10	<0.10	<0.10	<0.10	<0.1	<0.1

ISANTI COUNTY

STATION NUMBER	LOCAL IDENTIFIER	GEO-LOGIC UNIT	DATE	TIME	DEPTH BELOW LAND SURFACE (WATER LEVEL) (FEET) (72019)	DEPTH OF WELL, TOTAL (FEET) (72008)	ELEV. OF LAND SURFACE DATUM (FT. ABOVE NGVD) (72000)
452545093211901	034N24W17DCC01JENSEN_S(I1)	112OTSH	05-21-87	1300	8.79	12	935
452545093211902	034N24W17DCC02JENSEN_D(I2)	112OTSH	05-21-87	1400	8.91	18	935
453242093143501	035N23W05CCC01GOLDENWOOD_S(	112OTSH	05-21-87	0930	14.93	17	948
453242093143502	035N23W05CCC02GOLDENWOOD_D(	112OTSH	05-21-87	1030	15.04	22	948

DATE	SPE-CIFIC CON-DUCT-ANCE (US/CM) (00095)	SPE-CIFIC CON-DUCT-ANCE LAB (US/CM) (90095)	PH (STAND-ARD UNITS) (00400)	PH LAB (STAND-ARD UNITS) (00403)	TEMPER-ATURE WATER (DEG C) (00010)	ALKA-LINITY WH WAT TOTAL FIELD (MG/L AS CACO3) (00410)	SULFATE DIS-SOLVED (MG/L AS SO4) (00945)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL) (00940)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N) (00631)	NITRO-GEN, AMMONIA DIS-SOLVED (MG/L AS N) (00608)
05-21-87	312	275	6.3	6.5	10.0	30	19	2.4	20	0.19
05-21-87	1020	997	8.5	7.6	8.5	172	26	100	35	0.09
05-21-87	1140	1110	7.5	7.6	8.5	228	17	180	13	0.04
05-21-87	1170	1010	7.5	7.6	8.5	232	17	180	13	0.03

WATER QUALITY DATA, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

POPE COUNTY

STATION NUMBER	LOCAL IDENTIFIER	GEO-LOGIC UNIT	DATE	TIME	DEPTH BELOW LAND SURFACE (WATER LEVEL) (FEET) (72019)	DEPTH OF WELL, TOTAL (FEET) (72008)	ELEV. OF LAND SURFACE DATUM (FT. ABOVE NGVD) (72000)	SPE-CIFIC CON-DUCT-ANCE (US/CM) (00095)
452938095081502	123N36W01ACA02 CLINT WELTE(	112OTSH	06-03-87	1930	6.53	16	1305	610
454242095103701	126N36W23BCA01 ROSHOLT-WEST	112PLSC	08-26-87	1130	11.09	12	1335	605
454243095103001	126N36W23BAC01 ROSHOLT-WEST	112PLSC	08-26-87	1300	11.01	13	1335	628
454244095102201	126N36W23BAD01 ROSHOLT-WEST	112PLSC	08-26-87	1400	10.22	12	1334	599
454244095103701	126N36W23BBD01 ROSHOLT-WEST	112PLSC	08-26-87	1030	13.50	16	1337	564
454245095102301	126N36W23BAC09 ROSHOLT-WEST	112OTSH	10-23-86	1645	8.70	--	1335	580
		112OTSH	03-05-87	1130	10.70	--	1335	550
		112OTSH	05-11-87	1945	11.10	--	1335	600
		112OTSH	08-27-87	1500	11.31	--	1335	598
454245095102601	126N36W23BAC08 ROSHOLT-WEST	112OTSH	10-23-86	1615	8.90	12	1335	580
		112OTSH	03-05-87	1100	11.00	12	1335	560
		112OTSH	05-11-87	1915	11.20	12	1335	610
		112OTSH	08-27-87	1400	11.43	12	1335	598
454245095102801	126N36W23BAC07 ROSHOLT-WEST	112OTSH	10-23-86	1530	8.90	12	1335	560
		112OTSH	03-05-87	1000	10.80	12	1335	570
		112OTSH	05-11-87	1845	11.10	12	1335	620
		112OTSH	08-27-87	1300	11.33	12	1335	566
454245095103001	126N36W23BAC06 ROSHOLT-WEST	112OTSH	10-23-86	1430	9.00	12	1335	585
		112OTSH	03-05-87	0900	11.10	12	1335	540
		112OTSH	05-11-87	1815	11.40	12	1335	585
		112OTSH	08-27-87	1230	11.73	12	1335	565
454245095103201	126N36W23BBD06 ROSHOLT-WEST	112OTSH	10-23-86	1300	9.40	13	1336	560
		112OTSH	03-05-87	0800	11.60	13	1336	550
		112OTSH	05-11-87	1745	11.80	13	1336	580
		112OTSH	08-27-87	1030	12.01	13	1336	545
454245095103501	126N36W23BBD05 ROSHOLT-WEST	112OTSH	10-23-86	1100	10.00	13	1337	540
		112OTSH	03-04-87	1800	12.20	13	1337	600
		112OTSH	05-11-87	1715	12.50	13	1337	610
		112OTSH	08-27-87	0930	12.69	13	1337	598
454247095102301	126N36W23BAC05 ROSHOLT-WEST	112OTSH	10-24-86	0830	8.20	12	1334	600
		112OTSH	02-26-87	1430	--	12	1334	585
		112OTSH	08-27-87	1600	10.63	12	1334	606
454247095102501	126N36W23BAC04 ROSHOLT-WEST	112OTSH	10-24-86	0900	8.00	12	1334	570
		112OTSH	02-26-87	1300	--	12	1334	570
		112OTSH	08-26-87	1830	10.45	12	1334	545
454247095102801	126N36WBAC03 ROSHOLT-WESTPO	112OTSH	10-24-86	0930	8.40	12	1335	585
		112OTSH	02-26-87	1230	--	12	1335	575
		112OTSH	08-26-87	1730	10.98	12	1335	557
454247095103001	126N36W23BAC02 ROSHOLT-WEST	112OTSH	10-24-86	1000	8.70	13	1335	600
		112OTSH	02-26-87	1200	--	13	1335	530
		112OTSH	08-26-87	1630	11.16	13	1335	547
454247095103201	126N36W23BBD04 ROSHOLT-WEST	112OTSH	10-24-86	1030	900.00	12	1335	605
		112OTSH	02-26-87	1100	--	12	1335	525
		112OTSH	08-26-87	1530	11.60	12	1335	597
454247095103401	126N36W23BBD03 ROSHOLT-WEST	112OTSH	10-24-86	1100	9.40	12	1336	590
		112OTSH	02-26-87	1000	--	12	1336	560
		112OTSH	08-27-87	0830	11.99	12	1336	623
454248095103601	126N36W23BBD02 ROSHOLT-WEST	112PLSC	08-26-87	0930	13.25	15	1337	543
454254095102201	126N36W23BAA01ROSHOLT-WESTP	112PLSC	08-25-87	1500	11.88	15	1335	585
454254095103601	126N36W23BBA01 ROSHOLT-WEST	112PLSC	08-25-87	1700	12.99	15	1337	573

QUALITY OF GROUND WATER

WATER QUALITY DATA, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

POPE COUNTY--Continued

DATE	SPE- CIFIC CON- DUCT- ANCE LAB (US/CM) (90095)	PH (STAND- ARD UNITS) (00400)	PH LAB (STAND- ARD UNITS) (00403)	TEMPER- ATURE WATER (DEG C) (00010)	CALCIUM DIS- SOLVED (MG/L AS CA) (00915)	MAGNE- SIUM, DIS- SOLVED (MG/L AS MG) (00925)	SODIUM, DIS- SOLVED (MG/L AS NA) (00930)	POTAS- SIUM, DIS- SOLVED (MG/L AS K) (00935)	ALKA- LINITY WH WAT TOTAL FIELD (MG/L AS CACO3) (00410)	ALKA- LINITY LAB (MG/L AS CACO3) (90410)	SULFATE DIS- SOLVED (MG/L AS SO4) (00945)
06-03-87	624	7.5	7.6	7.5	--	--	--	--	248	--	20
08-26-87	581	7.6	7.6	12.0	--	--	--	--	250	--	12
08-26-87	--	7.4	--	11.5	--	--	--	--	240	--	--
08-26-87	--	7.5	--	12.0	--	--	--	--	262	--	--
08-26-87	544	7.7	7.7	11.0	--	--	--	--	228	--	16
10-23-86	566	7.4	7.6	12.0	83	26	3.9	1.4	280	271	15
03-05-87	540	7.6	7.6	6.0	--	--	--	--	268	--	9.8
05-11-87	--	--	--	7.5	--	--	--	--	--	--	--
08-27-87	572	7.6	7.5	12.0	--	--	--	--	268	--	8.5
10-23-86	559	7.5	7.6	11.5	82	27	3.7	1.4	270	255	13
03-05-87	540	7.5	7.6	6.0	--	--	--	--	260	--	13
05-11-87	--	--	--	7.5	--	--	--	--	--	--	--
08-27-87	582	7.6	7.7	12.0	--	--	--	--	276	--	15
10-23-86	546	7.4	7.6	11.5	78	26	3.8	1.6	250	254	13
03-05-87	556	7.5	7.6	6.0	--	--	--	--	268	--	13
05-11-87	--	--	--	7.5	--	--	--	--	--	--	--
08-27-87	446	7.6	7.6	11.5	--	--	--	--	260	--	15
10-23-86	571	7.5	7.6	11.5	83	27	3.3	1.4	270	257	14
03-05-87	535	7.6	7.6	5.5	--	--	--	--	260	--	13
05-11-87	--	--	--	7.5	--	--	--	--	--	--	--
08-27-87	529	7.6	7.8	12.0	--	--	--	--	244	--	12
10-23-86	544	7.6	7.6	11.5	78	26	3.5	1.4	260	249	12
03-05-87	556	7.7	7.6	5.5	--	--	--	--	256	--	11
05-11-87	--	--	--	8.0	--	--	--	--	--	--	--
08-27-87	511	7.7	7.7	11.5	--	--	--	--	236	--	7.2
10-23-86	528	7.4	7.6	12.0	77	25	3.5	1.5	250	250	13
03-04-87	581	7.5	7.5	5.5	--	--	--	--	276	--	17
05-11-87	--	--	--	8.0	--	--	--	--	--	--	--
08-27-87	552	7.7	7.7	11.5	--	--	--	--	236	--	13
10-24-86	586	7.6	7.6	11.5	84	28	4.2	1.7	270	264	17
02-26-87	557	7.6	7.6	6.0	--	--	--	--	256	--	17
08-27-87	551	7.5	7.6	12.0	--	--	--	--	268	--	13
10-24-86	554	7.6	7.6	11.5	81	27	3.1	1.8	260	252	15
02-26-87	552	7.7	7.6	6.0	--	--	--	--	234	--	16
08-26-87	548	7.6	7.9	12.0	--	--	--	--	256	--	13
10-24-86	564	7.6	7.6	11.0	81	27	3.9	1.5	250	247	15
02-26-87	561	7.6	7.5	5.5	--	--	--	--	240	--	15
08-26-87	518	7.6	7.9	12.0	--	--	--	--	250	--	13
10-24-86	581	7.6	7.7	11.0	83	27	4.2	1.9	250	241	17
02-26-87	549	7.7	7.6	6.0	--	--	--	--	244	--	15
08-26-87	543	7.6	7.7	12.0	--	--	--	--	240	--	8.5
10-24-86	594	7.6	7.6	11.0	84	27	3.2	1.4	260	261	16
02-26-87	535	7.7	7.6	5.5	--	--	--	--	240	--	12
08-26-87	--	7.8	--	12.0	--	--	--	--	260	--	--
10-24-86	581	7.5	7.6	11.0	81	28	3.5	1.4	290	279	14
02-26-87	578	7.7	7.6	5.5	--	--	--	--	268	--	17
08-27-87	543	7.7	7.8	12.0	--	--	--	--	248	--	15
08-26-87	535	7.8	7.7	12.0	--	--	--	--	248	--	11
08-25-87	577	7.9	7.6	11.0	--	--	--	--	280	--	16
08-25-87	538	7.8	8.3	11.0	--	--	--	--	242	--	18

QUALITY OF GROUND WATER

WATER QUALITY DATA, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

POPE COUNTY--Continued

DATE	CHLORIDE, DIS-SOLVED (MG/L AS CL) (00940)	FLUORIDE, DIS-SOLVED (MG/L AS F) (00950)	SILICA, DIS-SOLVED (MG/L AS SIO2) (00955)	NITROGEN, NITRITE DIS-SOLVED (MG/L AS N) (00613)	NITROGEN, NO2+NO3 DIS-SOLVED (MG/L AS N) (00631)	NITROGEN, AMMONIA DIS-SOLVED (MG/L AS N) (00608)	NITROGEN,AMMONIA + ORGANIC DIS. (MG/L AS N) (00623)	PHOSPHORUS, ORTHO, DIS-SOLVED (MG/L AS P) (00671)	BORON, DIS-SOLVED (UG/L AS B) (01020)	IRON, DIS-SOLVED (UG/L AS FE) (01046)	MANGANESE, DIS-SOLVED (UG/L AS MN) (01056)
06-03-87	22	--	--	--	8.5	0.04	--	--	--	--	--
08-26-87	16	--	--	--	9.4	<0.01	--	--	--	--	--
08-26-87	15	--	--	--	11	--	--	--	--	--	--
08-26-87	13	--	--	--	6.0	--	--	--	--	--	--
08-26-87	9.9	--	--	--	12	<0.01	--	--	--	--	--
10-23-86	6.8	<0.1	25	<0.01	7.5	<0.01	0.40	<0.010	30	5	31
03-05-87	6.0	--	--	--	4.2	0.07	--	--	--	--	--
05-11-87	--	--	--	--	--	--	--	--	--	--	--
08-27-87	11	--	--	--	--	--	--	--	--	--	--
10-23-86	9.4	0.1	25	<0.01	8.8	<0.01	0.50	<0.010	20	25	32
03-05-87	11	--	--	--	6.0	0.08	--	--	--	--	--
05-11-87	--	--	--	--	--	--	--	--	--	--	--
08-27-87	10	--	--	--	6.6	<0.01	--	--	--	--	--
10-23-86	9.1	<0.1	25	<0.01	7.9	<0.01	0.50	<0.010	20	31	37
03-05-87	13	--	--	--	6.3	0.08	--	--	--	--	--
05-11-87	--	--	--	--	--	--	--	--	--	--	--
08-27-87	10	--	--	--	6.5	<0.01	--	--	--	--	--
10-23-86	8.6	0.1	26	<0.01	10	<0.01	--	<0.010	30	8	25
03-05-87	10	--	--	--	5.2	0.04	--	--	--	--	--
05-11-87	--	--	--	--	--	--	--	--	--	--	--
08-27-87	8.2	--	--	--	8.5	0.01	--	--	--	--	--
10-23-86	8.9	0.1	25	0.01	8.6	0.01	0.50	0.010	30	6	43
03-05-87	14	--	--	--	7.1	0.08	--	--	--	--	--
05-11-87	--	--	--	--	--	--	--	--	--	--	--
08-27-87	7.7	--	--	--	6.5	<0.01	--	--	--	--	--
10-23-86	6.2	0.1	24	0.03	7.2	0.01	0.40	<0.010	30	22	51
03-04-87	15	--	--	--	10	0.06	--	--	--	--	--
05-11-87	--	--	--	--	--	--	--	--	--	--	--
08-27-87	10	--	--	--	11	<0.01	--	--	--	--	--
10-24-86	10	0.1	24	0.01	8.9	0.03	2.6	0.010	30	10	26
02-26-87	11	--	--	--	8.5	0.07	--	--	--	--	--
08-27-87	10	--	--	--	--	--	--	--	--	--	--
10-24-86	11	0.1	25	<0.01	7.5	0.02	2.3	0.010	20	9	41
02-26-87	11	--	--	--	10	0.11	--	--	--	--	--
08-26-87	12	--	--	--	6.6	<0.01	--	--	--	--	--
10-24-86	11	0.1	24	<0.01	9.3	0.02	1.7	0.010	30	9	27
02-26-87	10	--	--	--	11	0.08	--	--	--	--	--
08-26-87	9.3	--	--	--	6.6	<0.01	--	--	--	--	--
10-24-86	10	0.1	24	<0.01	12	0.01	2.5	<0.010	20	6	14
02-26-87	9.5	--	--	--	8.9	0.06	--	--	--	--	--
08-26-87	8.6	--	--	--	6.2	--	--	--	--	--	--
10-24-86	10	<0.1	24	<0.01	11	0.01	3.1	<0.010	30	22	34
02-26-87	7.2	--	--	--	9.9	0.07	--	--	--	--	--
08-26-87	--	--	--	--	6.2	<0.01	--	--	--	--	--
10-24-86	8.0	<0.1	26	<0.01	6.8	0.01	1.3	0.010	40	23	40
02-26-87	7.0	--	--	--	8.3	0.07	--	--	--	--	--
08-27-87	8.5	--	--	--	9.8	<0.01	--	--	--	--	--
08-26-87	8.2	--	--	--	9.0	<0.01	--	--	--	--	--
08-25-87	8.9	--	--	--	6.7	<0.01	--	--	--	--	--
08-25-87	6.6	--	--	--	3.9	<0.01	--	--	--	--	--

POPE COUNTY--Continued

VOLATILE ORGANIC ANALYSES

STATION NUMBER	LOCAL IDENTIFIER	GEO-LOGIC UNIT	DATE	TIME	PRO-PAZINE TOTAL (UG/L) (39024)	TRI-FLURA-LIN TOTAL RECOVER (UG/L) (39030)	SIME-TRYNE TOTAL (UG/L) (39054)
454242095103701	126N36W23BCA01 ROSHOLT-WEST	112PLSC	08-26-87	1130	<0.10	<0.10	<0.1
454243095103001	126N36W23BAC01 ROSHOLT-WEST	112PLSC	08-26-87	1300	<0.10	<0.10	<0.1
454244095102201	126N36W23BAD01 ROSHOLT-WEST	112PLSC	08-26-87	1400	<0.10	<0.10	<0.1
454244095103701	126N36W23BBD01 ROSHOLT-WEST	112PLSC	08-26-87	1030	<0.10	<0.10	<0.1
454245095102301	126N36W23BAC09 ROSHOLT-WEST	112OTSH	10-23-86	1645	<0.10	--	<0.1
		112OTSH	03-05-87	1130	<0.10	<0.10	<0.1
		112OTSH	05-11-87	1945	<0.10	<0.10	<0.1
		112OTSH	08-27-87	1500	<0.10	<0.10	<0.1
454245095102601	126N36W23BAC08 ROSHOLT-WEST	112OTSH	10-23-86	1615	<0.10	--	<0.1
		112OTSH	03-05-87	1100	<0.10	<0.10	<0.1
		112OTSH	05-11-87	1915	<0.10	<0.10	<0.1
		112OTSH	08-27-87	1400	<0.10	<0.10	<0.1
454245095102801	126N36W23BAC07 ROSHOLT-WEST	112OTSH	10-23-86	1530	<0.10	--	<0.1
		112OTSH	03-05-87	1000	<0.10	<0.10	<0.1
		112OTSH	05-11-87	1845	<0.10	<0.10	<0.1
		112OTSH	08-27-87	1300	<0.10	<0.10	<0.1
454245095103001	126N36W23BAC06 ROSHOLT-WEST	112OTSH	03-05-87	0900	<0.10	<0.10	<0.1
		112OTSH	05-11-87	1815	<0.10	<0.10	<0.1
		112OTSH	08-27-87	1230	<0.10	<0.10	<0.1
454245095103201	126N36W23BBD06 ROSHOLT-WEST	112OTSH	03-05-87	0800	<0.10	<0.10	<0.1
		112OTSH	05-11-87	1745	<0.10	<0.10	<0.1
		112OTSH	08-27-87	1030	<0.10	<0.10	<0.1
454245095103501	126N36W23BBD05 ROSHOLT-WEST	112OTSH	03-04-87	1800	<0.10	<0.10	<0.1
		112OTSH	05-11-87	1715	<0.10	<0.10	<0.1
		112OTSH	08-27-87	0930	<0.10	<0.10	<0.1
454247095102301	126N36W23BAC05 ROSHOLT-WEST	112OTSH	02-26-87	1430	<0.10	<0.10	<0.1
		112OTSH	08-27-87	1600	<0.10	<0.10	<0.1
454247095102501	126N36W23BAC04 ROSHOLT-WEST	112OTSH	02-26-87	1300	<0.10	<0.10	<0.1
		112OTSH	08-26-87	1830	<0.10	<0.10	<0.1
454247095102801	126N36WBAC03 ROSHOLT-WESTPO	112OTSH	10-24-86	0930	<0.10	--	<0.1
		112OTSH	02-26-87	1230	<0.10	<0.10	<0.1
		112OTSH	08-26-87	1730	<0.10	<0.10	<0.1
454247095103001	126N36W23BAC02 ROSHOLT-WEST	112OTSH	02-26-87	1200	<0.10	<0.10	<0.1
		112OTSH	08-26-87	1630	<0.10	<0.10	<0.1
454247095103201	126N36W23BBD04 ROSHOLT-WEST	112OTSH	02-26-87	1100	<0.10	<0.10	<0.1
		112OTSH	08-26-87	1530	<0.10	<0.10	<0.1
454247095103401	126N36W23BBD03 ROSHOLT-WEST	112OTSH	02-26-87	1000	<0.10	<0.10	<0.1
		112OTSH	08-27-87	0830	<0.10	<0.10	<0.1
454248095103601	126N36W23BBD02 ROSHOLT-WEST	112PLSC	08-26-87	0930	<0.10	<0.10	<0.1
454254095102201	126N36W23BAA01ROSHOLT-WESTP	112PLSC	08-25-87	1500	<0.10	<0.10	<0.1
454254095103601	126N36W23BBA01 ROSHOLT-WEST	112PLSC	08-25-87	1700	<0.10	<0.10	<0.1

QUALITY OF GROUND WATER

WATER QUALITY DATA, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

POPE COUNTY--Continued

VOLATILE ORGANIC ANALYSES--Continued

DATE	SIMA-ZINE TOTAL (UG/L) (39055)	PROME-TONE TOTAL (UG/L) (39056)	PROME-TRYNE TOTAL (UG/L) (39057)	ATRA-ZINE, TOTAL (UG/L) (39630)	ALA-CHLOR TOTAL RECOVER (UG/L) (77825)	CYAN-AZINE TOTAL (UG/L) (81757)	AME-TRYNE TCTAL (82184)	METRI-BUZIN WATER WHOLE TOT.REC (UG/L) (82611)	METOLA-CHLOR WATER WHOLE TOT.REC (UG/L) (82612)
08-26-87	<0.10	<0.1	<0.1	<0.10	<0.10	<0.10	<0.10	<0.1	<0.1
08-26-87	<0.10	<0.1	<0.1	<0.10	<0.10	<0.10	<0.10	<0.1	<0.1
08-26-87	<0.10	<0.1	<0.1	<0.10	<0.10	<0.10	<0.10	<0.1	<0.1
08-26-87	<0.10	<0.1	<0.1	<0.10	<0.10	<0.10	<0.10	<0.1	<0.1
10-23-86	<0.10	<0.1	<0.1	0.30	--	<0.10	<0.10	--	--
03-05-87	<0.10	<0.1	<0.1	0.30	<0.10	<0.10	<0.10	<0.1	--
05-11-87	<0.10	<0.1	<0.1	0.50	<0.10	<0.10	<0.10	<0.1	--
08-27-87	<0.10	<0.1	<0.1	0.30	<0.10	<0.10	<0.10	<0.1	<0.1
10-23-86	<0.10	<0.1	<0.1	0.10	--	<0.10	<0.10	--	--
03-05-87	<0.10	<0.1	<0.1	0.20	<0.10	<0.10	<0.10	<0.1	--
05-11-87	<0.10	<0.1	<0.1	0.20	<0.10	<0.10	<0.10	<0.1	--
08-27-87	<0.10	<0.1	<0.1	0.10	<0.10	<0.10	<0.10	<0.1	<0.1
10-23-86	<0.10	<0.1	<0.1	0.10	--	<0.10	<0.10	--	--
03-05-87	<0.10	<0.1	<0.1	0.10	<0.10	<0.10	<0.10	<0.1	--
05-11-87	<0.10	<0.1	<0.1	0.20	<0.10	<0.10	<0.10	<0.1	--
08-27-87	<0.10	<0.1	<0.1	<0.10	<0.10	<0.10	<0.10	<0.1	<0.1
03-05-87	<0.10	<0.1	<0.1	210	<0.10	<0.10	<0.10	<0.1	--
05-11-87	<0.10	<0.1	<0.1	0.30	<0.10	<0.10	<0.10	<0.1	--
08-27-87	<0.10	<0.1	<0.1	0.20	<0.10	<0.10	<0.10	<0.1	<0.1
03-05-87	<0.10	<0.1	<0.1	270	<0.10	<0.10	<0.10	<0.1	--
05-11-87	<0.10	<0.1	<0.1	0.10	<0.10	<0.10	<0.10	<0.1	--
08-27-87	<0.10	<0.1	<0.1	<0.10	<0.10	<0.10	<0.10	<0.1	<0.1
03-04-87	<0.10	<0.1	<0.1	<0.10	<0.10	<0.10	<0.10	<0.1	--
05-11-87	<0.10	<0.1	<0.1	<0.10	<0.10	<0.10	<0.10	<0.1	--
08-27-87	<0.10	<0.1	<0.1	<0.10	<0.10	<0.10	<0.10	<0.1	<0.1
02-26-87	<0.10	<0.1	<0.1	0.10	<0.10	<0.10	<0.10	<0.1	--
08-27-87	<0.10	<0.1	<0.1	0.10	<0.10	<0.10	<0.10	<0.1	<0.1
02-26-87	<0.10	<0.1	<0.1	0.30	<0.10	<0.10	<0.10	<0.1	--
08-26-87	<0.10	<0.1	<0.1	0.10	<0.10	<0.10	<0.10	<0.1	<0.1
10-24-86	<0.10	<0.1	<0.1	0.20	--	<0.10	<0.10	--	--
02-26-87	<0.10	<0.1	<0.1	0.20	<0.10	<0.10	<0.10	<0.1	--
08-26-87	<0.10	<0.1	<0.1	0.20	<0.10	<0.10	<0.10	<0.1	<0.1
02-26-87	<0.10	<0.1	<0.1	0.20	<0.10	<0.10	<0.10	<0.1	--
08-26-87	<0.10	<0.1	<0.1	0.10	<0.10	<0.10	<0.10	<0.1	<0.1
02-26-87	<0.10	<0.1	<0.1	0.40	<0.10	<0.10	<0.10	<0.1	--
08-26-87	<0.10	<0.1	<0.1	0.20	<0.10	<0.10	<0.10	<0.1	<0.1
02-26-87	<0.10	<0.1	<0.1	0.10	<0.10	<0.10	<0.10	<0.1	--
08-27-87	<0.10	<0.1	<0.1	<0.10	<0.10	<0.10	<0.10	<0.1	<0.1
08-26-87	<0.10	<0.1	<0.1	<0.10	<0.10	<0.10	<0.10	<0.1	<0.1
08-25-87	<0.10	<0.1	<0.1	<0.10	<0.10	<0.10	<0.10	<0.1	<0.1
08-25-87	0.10	<0.1	<0.1	0.40	<0.10	<0.10	<0.10	<0.1	<0.1

WATER QUALITY DATA, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

STEARNS COUNTY

STATION NUMBER	LOCAL IDENTIFIER	GEO-LOGIC UNIT	DATE	TIME	DEPTH BELOW LAND SURFACE (WATER LEVEL) (FEET) (72019)	ELEV. OF LAND SURFACE DATUM (FT. ABOVE NGVD) (72000)	SPE-CIFIC CON-DUCT-ANCE (US/CM) (00095)
452751094300103	123N30W18BCD03 DRONTLE-CORN	112OTSH	06-04-87	1030	5.32	1107	1170
452752094300401	123N30W18BCD01 DRONTLE-OAK	112OTSH	06-04-87	0930	8.46	1112	1260

DATE	SPE-CIFIC CON-DUCT-ANCE LAB (US/CM) (90095)	PH (STAND-ARD UNITS) (00400)	PH LAB (STAND-ARD UNITS) (00403)	TEMPER-ATURE WATER (DEG C) (00010)	ALKA-LINITY WH WAT TOTAL FIELD (MG/L AS CACO3) (00410)	SULFATE DIS-SOLVED (MG/L AS SO4) (00945)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL) (00940)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N) (00631)	NITRO-GEN, AMMONIA DIS-SOLVED (MG/L AS N) (00608)
06-04-87	1160	7.3	7.4	10.0	380	39	41	34	0.14
06-04-87	1220	7.20	7.20	12.5	400	29	26	47	0.41

CHEMICAL QUALITY OF PRECIPITATION

461458094295000 PRECIPITATION STATION AT CAMP RIPLEY, MN

WATER-QUALITY RECORDS

LOCATION.--Lat 46°14'58", long 94°29'50", in NE¼ sec.18, T.132 N., R.30 W.,Morrison County, Hydrologic Unit 07010104, approximately 500 ft southwest of the abandoned Gilgal Church and approximately 5 miles south of the town of Pillager.

PERIOD OF RECORD.--October 1983 to September 1987 (weekly composite).

INSTRUMENTATION.--Samples are collected in a polyethylene bucket by an electrically operated wet/dry collector. A recording rain gage and a standard U.S. Weather Service bulk rain gage measure rainfall quantity.

REMARKS.--An observer collects only the wetfall bucket and services the rain gages every Tuesday around 0900 hours. The observer weighs the bucket and if there is enough wetfall, determines specific conductance and pH. The bucket with its remaining contents is then sent to the Illinois State Water Survey Laboratory for analysis.

CHEMICAL ANALYSES, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

WEEKLY COMPOSITE

DATE	TIME	ATM DEP WET TOTAL FOR PERIOD (IN) (00193)	SAMPLE SIZE (ML) (32002)	SPE-CIFIC CON-DUCT-ANCE (US/CM) (00095)	SPE-CIFIC CON-DUCT-ANCE LAB (US/CM) (90095)	PH (STAND-ARD UNITS) (00400)	PH LAB (STAND-ARD UNITS) (00403)	CALCIUM DIS-SOLVED (MG/L AS CA) (00915)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG) (00925)
OCT 07-14	0830	0.32	360	7	6	5.20	6.02	0.09	0.02
OCT 28-NOV 04	0900	0.06	150	12	12	5.30	6.29	0.50	0.09
NOV 04-11	0830	0.95	1200	21	18	4.70	4.95	0.36	0.07
NOV 11-18	0900	0.10	180	4	3	5.10	6.01	0.08	0.02
NOV 18-25	0830	0.27	380	13	11	4.70	4.90	0.12	0.02
NOV 25-DEC 02	0900	0.04	73	13	11	4.60	6.32	0.22	0.05
DEC 30-31	0900	0.20	340	17	13	--	4.69	0.08	0.01
JAN 01-06	0001	0.20	340	17	13	--	4.69	0.08	0.01
JAN 13-20	0830	0.12	76	7	9	--	6.71	0.12	0.04
JAN 27-FEB 03	0830	0.20	270	12	10	--	5.22	0.23	0.03
FEB 17-24	0900	0.05	95	7	8	5.20	6.33	0.29	0.07
FEB 24-MAR 03	0800	0.08	140	15	11	4.50	4.80	0.18	0.04
MAR 17-24	0700	1.12	1900	34	32	4.10	4.30	0.25	0.05
APR 07-14	0700	0.08	150	97	76	--	4.02	1.0	0.23
APR 14-21	0630	0.08	120	12	13	--	6.74	0.68	0.09
APR 21-28	0700	0.05	130	63	67	--	7.25	2.8	0.58
APR 28-MAY 05	0630	0.15	260	41	47	--	7.22	3.6	0.68
MAY 12-19	0700	1.28	2200	11	9	--	5.30	0.28	0.04
MAY 19-26	0700	3.05	4900	13	10	4.70	5.02	0.08	0.02
MAY 26-JUN 02	0700	0.14	260	9	10	5.80	5.99	0.27	0.08
JUN 09-16	0700	0.11	160	13	10	4.70	4.96	0.16	0.03
JUN 16-23	0730	0.15	280	8	7	4.90	5.01	0.08	0.01
JUN 23-30	0530	0.22	390	10	10	5.10	5.53	0.34	0.08
JUN 30-JUL 07	0600	0.55	1000	11	11	6.20	6.51	0.43	0.10

CHEMICAL QUALITY OF PRECIPITATION

461458094295000 PRECIPITATION STATION AT CAMP RIPLEY, MN--Continued

CHEMICAL ANALYSES, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

WEEKLY COMPOSITE

DATE	SODIUM, DIS-SOLVED (MG/L AS NA) (00930)	POTAS-SIUM, DIS-SOLVED (MG/L AS K) (00935)	SULFATE DIS-SOLVED (MG/L AS SO4) (00945)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL) (00940)	NITRO-GEN, NITRATE DIS-SOLVED (MG/L AS NO3) (71851)	NITRO-GEN, AMMONIA DIS-SOLVED (MG/L AS NH4) (71846)	PHOS-PHATE, DIS-SOLVED (MG/L AS PO4) (00653)	COL-LECTOR EFFI-CIENCY WET DEPOS. PERCENT (82284)
OCT 07-14	0.05	0.02	0.7	0.04	0.78	0.38	<0.01	66
OCT 28-NOV 04	0.06	0.05	1.3	0.11	1.8	0.92	<0.01	141
NOV 04-11	0.05	0.03	2.6	0.09	2.5	1.1	<0.01	73
NOV 11-18	0.09	0.01	0.1	0.05	0.48	0.12	<0.01	105
NOV 18-25	0.09	0.02	1.2	0.05	1.6	0.43	<0.01	83
NOV 25-DEC 02	0.72	0.02	1.5	0.16	1.2	0.46	<0.01	106
DEC 30-31	0.09	0.02	0.5	0.11	2.3	0.23	<0.01	99
JAN 01-06	0.09	0.02	0.5	0.11	2.3	0.23	<0.01	99
JAN 13-20	0.57	0.02	0.7	0.11	0.74	0.60	<0.01	37
JAN 27-FEB 03	0.16	0.02	0.8	0.16	2.1	0.47	<0.01	77
FEB 17-24	0.04	0.03	0.8	0.08	0.80	0.55	<0.01	110
FEB 24-MAR 03	0.05	0.00	0.7	0.11	1.7	<0.02	<0.01	103
MAR 17-24	0.07	0.03	3.9	0.12	2.9	0.83	<0.01	101
APR 07-14	0.10	0.09	10	0.35	8.2	3.1	<0.01	109
APR 14-21	0.14	0.11	1.3	0.13	1.3	0.71	<0.01	85
APR 21-28	0.16	0.23	7.3	0.29	8.6	6.3	<0.01	148
APR 28-MAY 05	0.36	0.42	4.3	0.67	6.0	2.5	<0.01	100
MAY 12-19	0.02	0.03	1.2	0.08	1.3	0.51	<0.01	98
MAY 19-26	0.03	0.03	1.3	<0.03	1.1	0.61	<0.01	93
MAY 26-JUN 02	0.06	0.04	1.1	0.12	1.8	0.74	<0.01	107
JUN 09-16	0.08	0.01	1.2	0.05	1.2	0.31	0.05	85
JUN 16-23	0.07	0.02	0.3	0.08	0.94	0.09	0.05	107
JUN 23-30	0.06	0.02	1.3	0.09	1.5	0.47	<0.02	103
JUN 30-JUL 07	0.05	0.02	1.1	0.10	1.3	0.74	<0.02	107

CHEMICAL QUALITY OF PRECIPITATION

461458094295000 PRECIPITATION STATION AT CAMP RIPLEY, MN--Continued

CHEMICAL ANALYSES, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

WEEKLY COMPOSITE

DATE	TIME	ATM DEP WET TOTAL FOR PERIOD (IN) (00193)	SAMPLE SIZE (ML) (32002)	SPE-CIFIC CON-DUCT-ANCE (US/CM) (00095)	SPE-CIFIC CON-DUCT-ANCE LAB (US/CM) (90095)	PH (STAND-ARD UNITS) (00400)	PH LAB (STAND-ARD UNITS) (00403)	CALCIUM DIS-SOLVED (MG/L AS CA) (00915)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG) (00925)
JUL 07-14	0630	0.27	480	10	12	5.90	6.42	0.44	0.06
JUL 14-21	0630	1.05	1800	7	7	5.40	6.04	0.20	0.03
JUL 21-28	0630	0.74	1300	10	10	5.10	5.50	0.29	0.04
JUL 28-AUG 04	0630	0.59	1000	8	9	5.80	6.33	0.34	0.08
AUG 11-18	0630	1.16	2000	6	7	5.70	6.27	0.20	0.05
AUG 18-25	0630	0.32	570	8	8	5.90	6.31	0.31	0.08
AUG 25-SEP 01	0630	0.08	130	11	13	5.80	6.73	0.56	0.15
SEP 01-08	0645	0.70	1300	9	7	4.90	5.81	0.17	0.03
SEP 08-15	0630	0.35	630	4	5	5.20	5.79	0.06	0.02
SEP 15-22	0530	1.30	2200	8	6	4.70	5.03	0.02	0.01

DATE	SODIUM, DIS-SOLVED (MG/L AS NA) (00930)	POTAS-SIUM, DIS-SOLVED (MG/L AS K) (00935)	SULFATE DIS-SOLVED (MG/L AS SO4) (00945)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL) (00940)	NITRO-GEN, NITRATE DIS-SOLVED (MG/L AS NO3) (71851)	NITRO-GEN, AMMONIA DIS-SOLVED (MG/L AS NH4) (71846)	PHOS-PHATE, DIS-SOLVED (MG/L AS PO4) (00653)	COL-LECTOR EFFI-CIENCY WET DEPOS. PERCENT (82284)
JUL 07-14	0.21	0.06	1.0	0.17	1.9	0.37	<0.02	103
JUL 14-21	0.09	0.02	0.9	0.08	1.1	0.48	<0.02	100
JUL 21-28	0.08	0.04	1.3	0.12	1.5	0.61	<0.02	--
JUL 28-AUG 04	0.04	0.03	0.8	0.08	1.2	0.70	0.03	102
AUG 11-18	0.04	0.03	0.8	0.04	1.0	0.29	<0.02	--
AUG 18-25	0.03	0.03	0.7	0.08	1.2	0.63	<0.02	103
AUG 25-SEP 01	0.28	0.05	0.8	0.10	1.2	0.73	<0.02	93
SEP 01-08	0.05	0.01	1	0.06	0.82	0.50	<0.02	104
SEP 08-15	0.08	0.01	0.5	0.04	0.47	0.29	<0.02	104
SEP 15-22	0.02	0.01	0.5	0.05	0.35	0.10	<0.02	97

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October 1, 1978

FACTORS FOR CONVERTING INCH-POUND UNITS TO INTERNATIONAL SYSTEM UNITS (SI)

The following factors may be used to convert the inch-pound units published herein to the International System of Units (SI).

Multiply inch-pound units	By	To obtain SI units
	Length	
inches (in)	$2.54\text{x}10^{1}$	millimeters (mm)
	$2.54\text{x}10^{-2}$	meters (m)
feet (ft)	$3.048\text{x}10^{-1}$	meters (m)
miles (mi)	$1.609\text{x}10^{0}$	kilometers (km)
	Area	
acres	$4.047\text{x}10^{3}$	square meters (m^2)
	$4.047\text{x}10^{-1}$	square hectometers (hm^2)
	$4.047\text{x}10^{-3}$	square kilometers (km^2)
square miles (mi^2)	$2.590\text{x}10^{0}$	square kilometers (km^2)
	Volume	
gallons (gal)	$3.785\text{x}10^{0}$	liters (L)
	$3.785\text{x}10^{0}$	cubic decimeters (dm^3)
	$3.785\text{x}10^{-3}$	cubic meters (m^3)
million gallons	$3.785\text{x}10^{3}$	cubic meters (m^3)
	$3.785\text{x}10^{-3}$	cubic hectometers (hm^3)
cubic feet (ft^3)	$2.832\text{x}10^{1}$	cubic decimeters (dm^3)
	$2.832\text{x}10^{-2}$	cubic meters (m^3)
cfs-days	$2.447\text{x}10^{3}$	cubic meters (m^3)
	$2.447\text{x}10^{-3}$	cubic hectometers (hm^3)
acre-feet (acre-ft)	$1.233\text{x}10^{3}$	cubic meters (m^3)
	$1.233\text{x}10^{-3}$	cubic hectometers (hm^3)
	$1.233\text{x}10^{-6}$	cubic kilometers (km^3)
	Flow	
cubic feet per second (ft^3/s)	$2.832\text{x}10^{1}$	liters per second (L/s)
	$2.832\text{x}10^{1}$	cubic decimeters per second (dm^3/s)
	$2.832\text{x}10^{-2}$	cubic meters per second (m^3/s)
gallons per minute (gal/min)	$6.309\text{x}10^{-2}$	liters per second (L/s)
	$6.309\text{x}10^{-2}$	cubic decimeters per second (dm^3/s)
	$6.309\text{x}10^{-5}$	cubic meters per second (m^3/s)
million gallons per day	$4.381\text{x}10^{1}$	cubic decimeters per second (dm^3/s)
	$4.381\text{x}10^{-2}$	cubic meters per second (m^3/s)
	Mass	
tons (short)	$9.072\text{x}10^{-1}$	megagrams (Mg) or metric tons

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